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MAGAZINE

JANUARY 14, 1992

THE INDEPENDENT GUIDE TO PERSONAL COMPUTING

VOLUME 11 NUMBER 1

Best of 1991 EDITORS PICK 29 FAVORITES



FIRST LOOKS

The NEC UltraLite SL/25C: First of The New Breed of Color Notebooks

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True-Color Video Boards: Millions of Colors but Pricey And Cranky

COMPUTERS

The Am386/40s: 15 Fast, Cheap, and Compatible PCs. . . Intel Should Worry



MultiSync 4FG

THE NEC MULTISYNC 4FG
RUNNING PAGEMAKER 4.0



THE HP SCANJET IIc



SYMANTEC'S Q&A 4.0



POLAROID'S DIGITAL
PALETTE CI-3000





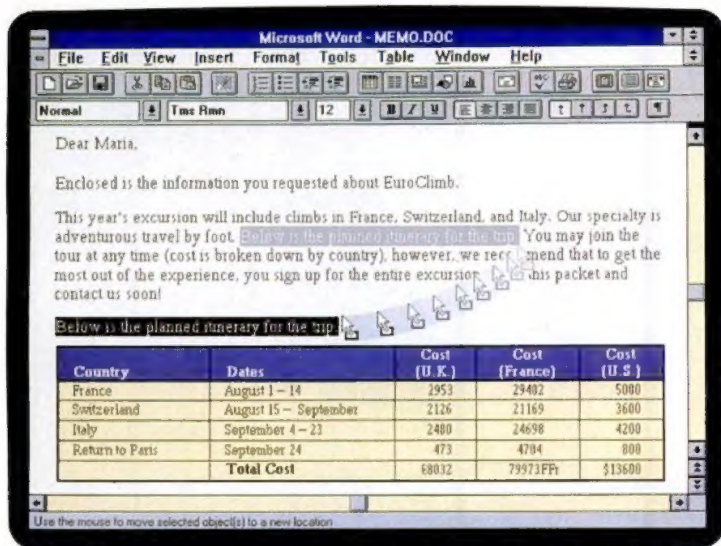
What do you want in a monitor?

MultiSync 460

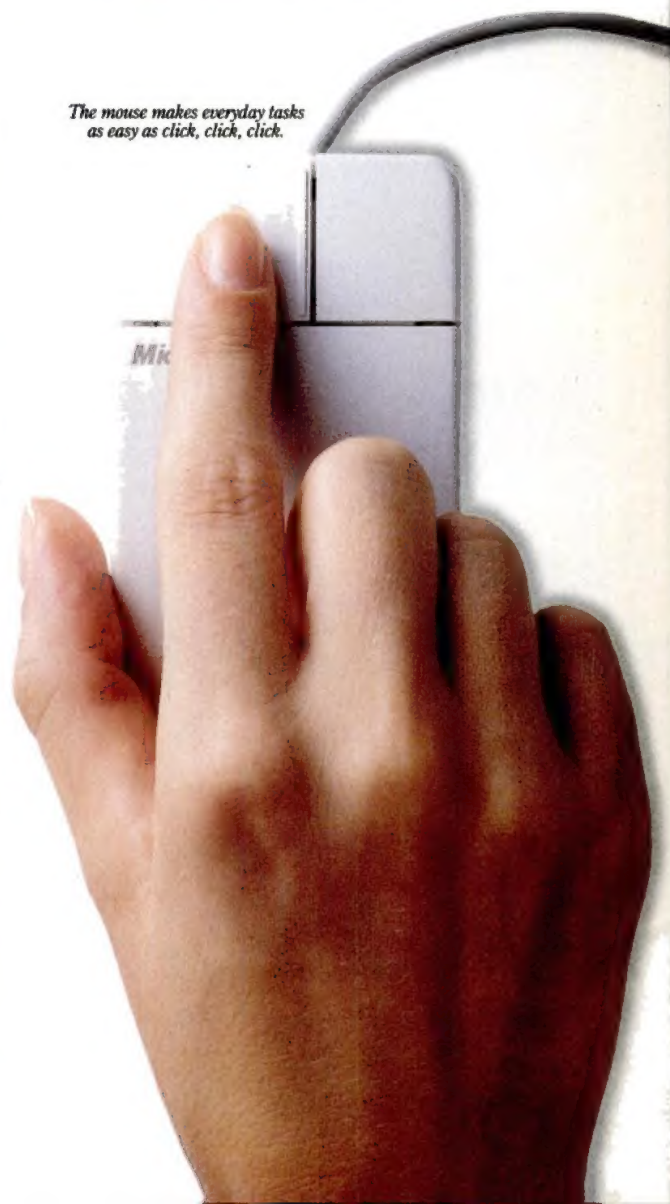
The first word that works like



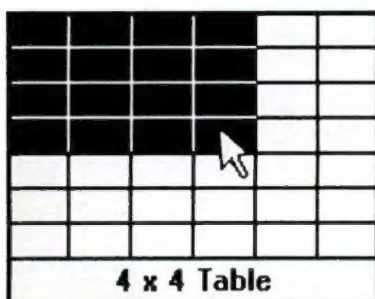
The Toolbar lets you do everyday things with the click of a button.



The mouse makes everyday tasks as easy as click, click, click.



Rearranging a document couldn't be any easier.
With new Word 2.0 you can drag and drop text wherever you want.



All it takes is one click on the
Toolbar and presto, instant tables.

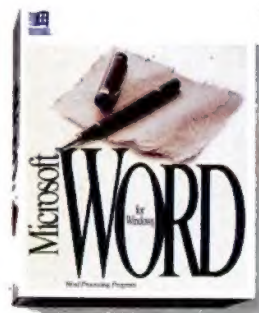


Click this Toolbar button and
get instant bullets.

rd processor second nature.



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This is possible for a number of reasons. Like our unique Toolbar™ feature. It lets you do those things you do most often with one simple click of a button.

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Inside

In this issue of *PC Magazine*, we've inaugurated a number of changes, with two objectives. One is intended to help you better understand the fast pace of change in the computer industry. The second will enable you to find our back-of-the-book technical columns more easily.

We publish more than 3,000 pages of product reviews, technology analyses, and productivity tips each year, but we still haven't been telling you everything we know.

In the process of gathering facts for our articles, we also learn about lawsuits, corporate changes, and marketing plans. We get hints from insiders about future developments. And we come across the findings of R&D labs that will only become widely known many months later.

For the past three years, some of these developments have appeared in my Pipeline column. In this issue, we're expanding our coverage with a new four-page section called Trends. Compiled by senior editor Robin Raskin, associate editor Mary Kathleen Flynn, and West Coast editor Christopher Barr, the Trends section will analyze news and technology developments in the computer industry.

The flood of new technologies and new alliances can bewilder even the most avid observer of the personal computer business. Drawing on the



resources of our editorial and labs staffs and our contributing editors, we will tell you what all the changes really mean and their long-term implications for this ever-changing business. I will continue to write Pipeline for the new section, but my column will analyze just one of the trends covered. We will also continue to carry our list of top-selling software. You'll find our inaugural section on page 29.

Beginning with this issue, you will also find a change in Productivity, the collection of technical columns that appears after the feature stories. To help you find these columns more easily, we have rearranged the order of the columns and divided them into two sections.



Trends team (clockwise from top left): Barr, Venditto, Raskin, and Flynn.

The first group of articles, which we call Solutions, includes Advisor, Tutor, User-to-User, Windows, The Working Word, Spreadsheets, Connectivity, and PC MagNet. The second group is Programming and includes Utilities, Lab Notes, Databases, Languages, Charles Petzold's Environments, and Ray Duncan's Power Programming.

We haven't changed the contents of these popular columns. Senior editor Trudy Neuhaus will continue to deliver articles that will help you work smarter. But by organizing the columns into two distinct groups, we believe you'll be able to get more out of your reading.—Gus Venditto ■

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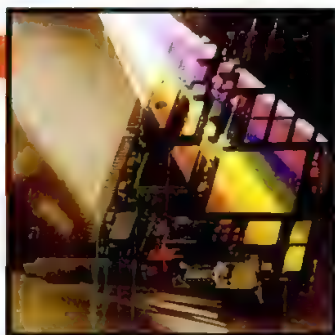
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Video: TTL Monochrome



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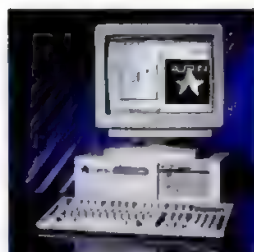
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Letters

THE DOS 5.0 DEBATE CONTINUES

In your October 15, 1991, Letters column, you published several letters under the heading "The DOS 5.0 Debate Begins." These writers reported the following problems or limitations with MS-DOS 5.0: *DESQview* won't run under DOS 5.0, certain sample BASIC programs crashed, DOS should have made more memory available, it should have provided more utilities and a graphical interface, Microsoft doesn't care about users, and on-line help is missing for some commands. You published these charges without editorial comment, leading some readers to believe that the charges have merit.

We tested all the charges (except one) and found them to be false. The only thing we haven't yet tested is the charge about on-line help. The writer doesn't say which commands don't have it, and we haven't yet gotten up the grit to sit down and methodically work our way through each and every command. We can, however, state that for all the commands we have used so far, DOS 5.0 provides on-line help.

Kirk Graham, Steve Schwartz
New Orleans, Louisiana

About the letter describing the incompatibility between DOS 5.0 and *DESQview*, I disagree completely. I have configured the perfect marriage between them:

```
DEVICE=C:\QEMM386.SYS EMBMEM=1024
DEVICE=C:\QRAM.SYS
DOS=HIGH, UMB
DEVICEHIGH=C:\DOS\SMARTDRV.SYS 1024
```

The first line excludes enough EMS memory to be managed as extended memory for the SMARTDRV.SYS, since Microsoft recommends this. The Quarterdeck *QRAM* device driver replaces HIMEM.SYS (supplied with DOS 5.0). *QRAM* provides the services to load DOS high. Use of the UMB (upper memory blocks) is provided by QEMM386.SYS instead of EMM386.EXE (provided by DOS 5.0).

Usage was greater with DOS 5.0 and



Quarterdeck's memory managers working together than with either one working alone. Now DOS can be loaded high, as well as just about everything else in my CONFIG.SYS and AUTOEXEC.BAT files. *DESQview* can run without memory or interrupt conflicts.

Alan A. Phillips
Tacoma, Washington

Jeff Prosis said in his article "DOS 5.0: What's in it for You?" (September 24, 1991) that MS-DOS 5.0 "is worth whatever you pay for it." Where has Mr. Prosis been? In August, I bought a DR DOS 5.0 upgrade that allowed me to upgrade conveniently from MS-DOS 4.1 (or any DOS) for \$39 from PC Connection. I saw the ad in *your* magazine! If MS-DOS 5.0 is really worth "whatever you pay for it," then DR DOS 5.0 is worth far more than \$39.

And who is the clone here? Prosis said that MS-DOS is trying to catch up to DR DOS. DR DOS 5.0 is great and 6.0 is on the way to my desk! My computer will probably never see MS-DOS again.

Waylan B. Owens
Crosby, Mississippi

Prior to buying MS-DOS 5.0 and Windows, computing was pretty ho-hum. Put data in. Get data out. Now every boot-up is an adventure. I never know when my word processing files will contain hieroglyphics or lock up when scrolling or switching programs. Thanks, Microsoft, for putting some excitement back into computing.

J. Grady Cash
Omaha, Nebraska

ABOUT THAT ACCOUNTING REVIEW

Your article "Downsizing to LAN-Based Accounting" (October 15, 1991), omits the most important evaluation factor for the largest segment of the market. That is: How do you migrate from a mini- or mainframe-based accounting system to one of the LAN-based ones?

The number of brand-new companies looking to install their first accounting system must be dwarfed by the number of existing companies using ancient technology and eager to move to new systems.

My company would love to have graphical interfaces, laser printing, bar code entry, and so on, but it would take us six months of work to convert to any of the systems you reviewed, since those companies provide no help. And the cost of conversion would be much higher than the purchase cost you listed.

Please add "migration path from existing packages" as an evaluation criterion in your next review.

William Dietrich
Sunnyvale, California

When I first read through your review of accounting software, I thought you were making a humorous (maybe even political) statement about our recently imposed taxation system. Although many Canadians feel it is a "Gross Sales Tax" (as you called it on page 148), GST actually stands for Goods and Services Tax. Thank you for that lighter side.

Todd Keys
London, Ontario, Canada

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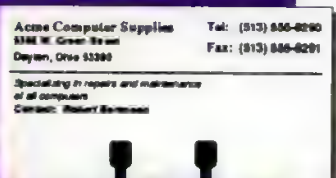
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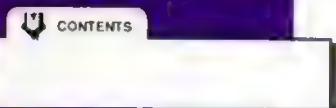
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Letters

BITS AND PIECES

In the perpetual debate of terms, we have datum (singular) versus data (plural), and word (16 bits) versus byte (8 bits) versus nibble (4 bits). We should move quickly to plug the gaping hole left by our data definitions. I hereby define the 2-bit data value to be known as the *crumb*.

Von Kenric Kaneshiro
San Jose, California

INDUSTRY NOTES

It seems that software makers show little respect for their customers when dollars are involved. Both WordPerfect Corp. and Central Point Software are offering reduced prices for upgrades to customers who have bought WordPerfect 5.1 and PC Tools 6.0 within the past six months. Loyal customers who purchased the software before that get to pay full price! Some thanks for having enough faith in a company and its product to buy before the release date!

I can't help but feel cheated. I'm writing to WordPerfect and Central Point to say I'm tired of being left out of the good deals, and I encourage other PC Magazine users to do the same.

Edward T. Urbansky
West Lafayette, Indiana

Considering the incredible influence that shareware is having on the software industry, I am wondering why you don't have a section of your magazine devoted to shareware reviews. This would benefit the thousands of people who are just discovering this dimension of the industry, and it would certainly be appreciated by us veteran shareware users.

Scott Bigler
Waynesboro, Virginia

I have a suggestion for a new section in your magazine. The section could be placed opposite the "Abort, Retry, Fail?" column and should be called "The Hall of Shame." This column would list all hardware and software vendors that have a reputation for poor business practices.

I'm sure there are many readers who have been victimized. You would provide a great service to your readers and the industry by weeding out the vermin.

Vince W. Rooney
Brooklyn, New York

PRINTER PROBLEM

I just read Bill O'Brien's review of the new Lexmark LaserPrinter line (First Looks, October 29, 1991) and I feel compelled to comment specifically on the significance of PPDS. O'Brien says, "PPDS is a compatibility convenience" that emulates the 9-pin Proprinter line. Obviously, O'Brien spent little time with this powerful datastream.

PPDS as implemented on the new Lexmark LaserPrinters is the native datastream for this new line and is not simply a Proprinter emulation. It supports such laser-printer-specific features as Type 1 scalable fonts including download, image decompression, 300-dpi graphics support, and printing in four orientations on a single page—features found in datastreams such as PCL 5 and PostScript. There are also many software drivers available that take advantage of these advanced features, including Microsoft Windows 3.0, OS/2, WordPerfect, and Lotus 1-2-3.

I suggest that O'Brien take another look at PPDS as implemented on the new Lexmark LaserPrinter line to see what it is capable of. The technical reference is a good starting point. Then, maybe O'Brien can give an informed statement as to its "convenience."

J. Keith Wedinger
Lexington, Kentucky



I wonder if it's coincidence that Mr. Wedinger's home city and state are the same as those of Lexmark. It's quite good to affirm loyalty to a homegrown product, but one shouldn't lose sight of reality in the process.

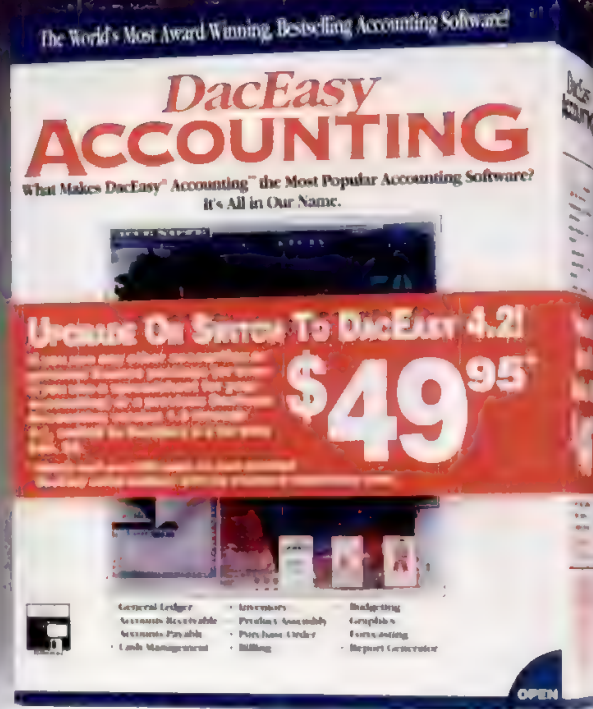
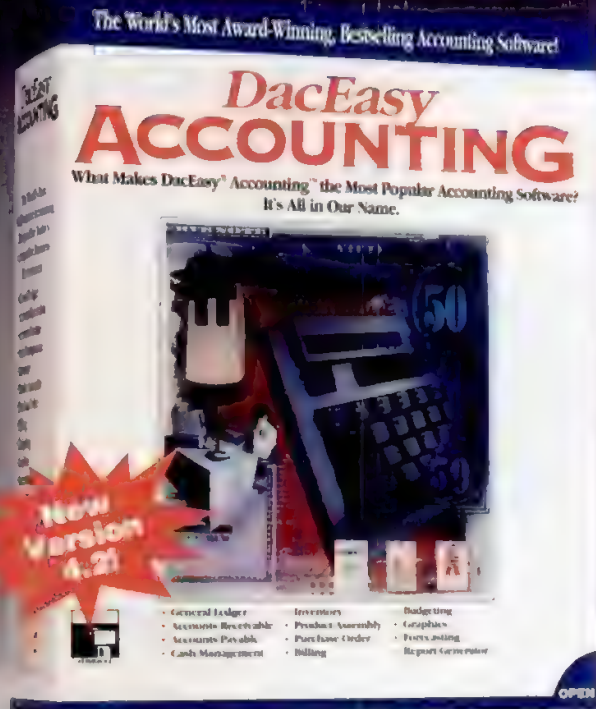
I would have loved to take a more comprehensive look at PPDS. Calling it a concession to Proprinter compatibility was a kindness on my part. I was not impressed with a 300-by-300-dpi laser printer that couldn't emulate a 24-pin 370-by-370-dpi dot matrix engine because the conversion was deemed too complex.

When the printer was reviewed for First Looks and then again for PC Magazine's annual printer issue, there were no PPDS drivers beyond whatever had been available for the 4019 series.

At such time as PPDS becomes a reality of the same stature as PostScript and PCL among the general population—and not just for IBM—I'm sure there will be sufficient information and facilities available to arrive at an informed opinion. Until then, PPDS is an interesting feature if you're looking for 9-pin dot matrix

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P. 92

PC WEEK REVIEWS

February 1992

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By David Coombe

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Letters

output from your laser printer. Thankfully, Lexmark has created an otherwise excellent printer with built-in PCL and optional PostScript, so you'll have something to do while waiting for that day to arrive.—*Bill O'Brien*

A WINDOWS WORLD

I am not trying to knock Windows, I use it. But I have a problem when I read "which operating system do you use, DOS, Unix, DR DOS, or Windows?" When did Windows start running without DOS? Why do you continue to put it in the same class with operating systems? It is just a front-end user interface to be compared with DOSSHELL (in DOS 5.0), and *DESQview*.

Larry G. Krupp
Clio, Michigan

About your graphics illustration software review ("Artistry for All: Four Illustration Packages," October 29, 1991): I find it frustrating that the best software is only available under Windows. I do a lot of work with graphics, I feel that I am forced to purchase Windows if I want to use state-of-the-art graphics tools, and I really resent this. I have yet to be convinced that giving up megabytes of disk space and RAM just to run Windows is worth any memory management advantages that might be gained. Now it appears that the major graphics software vendors are consorting to ram this standard down my throat by not offering DOS versions of their products. Why won't they give *me* the choice of which operating system I choose to use?

Heinz Schuller
Oak Park, Illinois

COLOR MY PC

Additional information to the letters from Paul N. Weissler (April 16, 1991) and Judy Elwood (August 1991) regarding different colors for PCs: Although the costs are prohibitive to produce PCs in a variety of colors using conventional suppliers of cabinet components, specialty coatings for recoating cabinets are available for this purpose. They are designed not to damage the plastic resins used in computer construction, and come in many colors; they have been used to coat computers, bank machines, and other office machines.

Incorporating these colors into a PC assembly line requires a spray paint facil-

ity, but color changes are easily made and short runs are economically possible.

Douglas E. Thomson
Stuart Plastics, Ltd.
Burnaby, British Columbia, Canada

CORRECTIONS AND AMPLIFICATIONS

In New & Improved (October 29, 1991) we should have stated that Falcon Electric's SUVS Plus is a UVS (uninterruptible voltage source). It combines the functionality of voltage regulators and line conditioners; it also provides a substantial ride-through capability of several cycles during brief power interruptions that is not found in voltage regulators and line conditioners.

Though there is no structured update policy or pricing for *The Norton Antivirus* ("On Guard: 20 Utilities that Battle the Virus Threat," October 29, 1991), Symantec Corp. does have a virus faxback service and posts periodic software updates on a bulletin board (408-973-9598) and in a CompuServe forum (GO NORUTL).

The price of *Magic Cursor*, a mouse enhancing utility from Fanfare Software, in the article "Field Mice: Different, Yes. Better, Maybe," October 15, 1991, should have read \$49.95, not \$79.95. At the correct price, our description, "robust but expensive," was overstated.

Definitions Plus ("Write on Target: 15 Writers' Tools," September 24, 1991) was developed from the actual typesetter's tapes for the 796-page (from A to Z) office edition of *The American Heritage Dictionary*, not the 500-page abridgement that was reported in the review. *Definitions Plus* is the only electronic dictionary that can run in as little as 4K of RAM.

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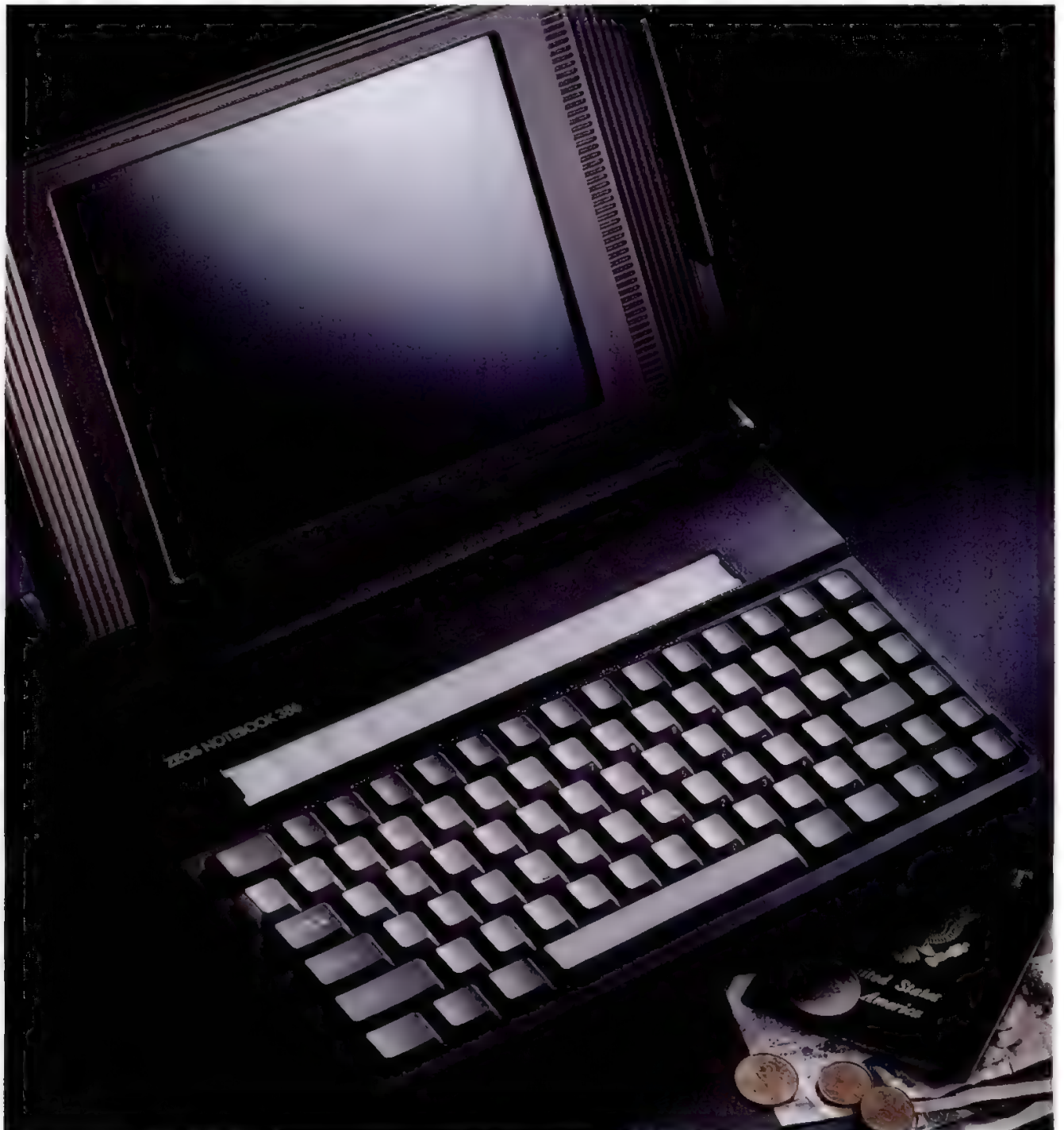
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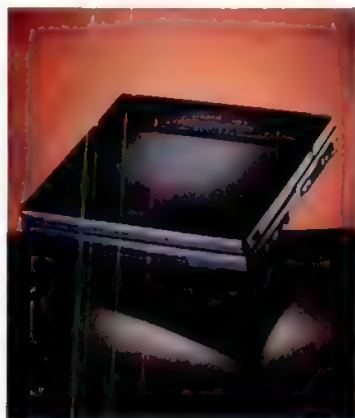
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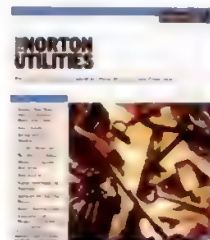
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Trends

Trends & Technology Shaping the Personal Computer Market

Color Comes to The Notebook PC

Will Yours Be Active or Passive?

The current crop of color portables are AC-only, seriously overweight, and far too expensive. But a new breed of color notebook-sized computers, scheduled to begin appearing this January, will best their ancestors on all counts.

By mid-March, you'll be able to choose from half a dozen color notebooks, weighing between

display technologies and thinner backlight tubes that drain less power. As notebook manufacturers draw their battle lines, they'll be forced to weigh price tag against color quality.

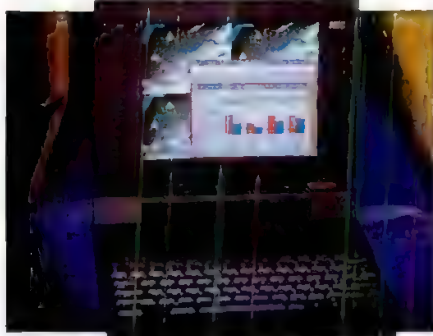
PASSIVE:

Lower Price, Less Color

AST, Dell, and Leading Edge are in the passive-matrix camp, with the less expensive units (\$3,500 to \$5,000), but less impressive color. Passive technology displays are built very much like monochrome LCD panels and have either 8 or 16 colors, but can reach up to 256 colors through a video controller. Passive panels tend to have slower response times (which means weaker colors), but because they use fewer components they are less costly to manufacture.

Electrodes are etched in columns and rows onto the panes of

CONTINUES ON PAGE 32



Due this spring, the Sharp PC-6881 will sport an active-matrix color display.

5.7 and 7.4 pounds, priced between \$3,500 and \$7,300, and all capable of running on battery power.

The catalysts for this notebook breakthrough are improved

Parallel Port Speeds Up

The parallel port just got a whole lot faster. Zenith Data Systems (ZDS) and Xircom have developed the Enhanced Parallel Port (EPP), which promises a 400 percent increase in the average transfer rate. The faster port is especially significant for users of portable PCs, because they depend primarily on the parallel port to exchange data with desktop PCs and networks. Desktop systems also stand to gain from a faster parallel port: speedier laser printing, for example.

Although ZDS's \$4,999 MastersPort 386SLe notebook is the only system that currently uses EPP, other portables are likely to have it soon. Intel has built EPP into its 82360SL chip set to be used with battery-operated portables, and 45 other vendors—including Dell, NEC, Sharp, and Toshiba—have announced products based on the chip set.

Just because a laptop uses the SL chip set doesn't mean it has the faster port, however. Systems vendors will have to explicitly support EPP in firmware and in the BIOS. And while today's LAN adapters and printers will work with EPP, most won't take advantage of the speed boost. The only products

that are currently clearly EPP-capable are Xircom's own LAN adapters. Hewlett-Packard's HP LaserJet IIIP can receive data at higher rates, so it may get some performance gain from EPP, but HP has not yet tested it.

For the time being, EPP will be limited to SL-based notebooks. But a fast parallel port—possibly with bidirectional capabilities—is sure to show up on Intel-based desktop systems.—Mary Kathleen Flynn

IBM and Intel To Develop New Chips

A new ten-year agreement between IBM and Intel should pump new life into Intel's long-dominant x86 chip architecture. The deal expands and extends an agreement between the two that goes back ten years to the birth of the IBM PC. The partners will develop highly integrated CPUs based on Intel's 486 chip. The first product, due in 1993, will integrate onto one chip the 486 core logic and system logic and IBM's XGA graphics, cache controller, and possibly the hard disk controller.

The joint venture offers advantages to both companies, each of which has put up half of the capital, the 100-person engineering staff, and the management team. IBM will have access to the new chips three to four months before its competitors. And with 50 percent of manufacturing rights, IBM won't depend on Intel or any second source for its chip supply. The development effort is separate from the work IBM is doing with Apple and Motorola in RISC-based systems and multimedia.

Intel gets to keep its biggest

CONTINUES ON PAGE 30

UPCOMING COLOR NOTEBOOKS

	Price	Screen technology	Available
AST Premium Exec 386SX/25C	\$4,995	Passive matrix	January
Dell System 325NC	\$5,000	Passive matrix	January
Epson NB-SL/25C	\$7,249	Active matrix (MIM)	Second quarter
Leading Edge N3/SL25 Color	\$3,495	Passive matrix	Second quarter
NEC Ultralite SL/25C	\$6,000	Active matrix (TFT)	January
Sharp PC 6881	TBA	Active matrix (TFT)	March



Pipeline

by Gus Venditto

Fiber Optic Phone System Faces A Long Road

After several years of study, the FCC is finally ready to give phone companies the right to transmit television broadcasting. That may not sound like an issue that matters to PC users, but if local phone companies are allowed to compete with cable TV operators, PC users stand to receive a windfall: the same nationwide fiber-optic network that would carry TV signals and phone calls would also carry data at 45 megabits per second.

A fiber-optic phone network could cost over \$100 billion to install nationwide, which is why clearance from the FCC to provide TV service is considered essential.

The bad news is that this project, often called "video dial tone," could require 20 years or more. Lobbying from cable TV operators (including such big guns as Time Warner) will slow the process, as will the state of the technology: The network would require enormous work in developing and debugging switching equipment at regional phone offices.

Even so, the plan may bring significant benefits in the next few years, since local phone companies will be encouraged to step up the investment they're making in fiber-optic cable. As long stretches of copper phone wire are replaced with fiber-optic cable, phone service will be strengthened in many small communities that are miles from switching stations. Phone lines that may now be too weak to support data transfer of 9,600 bps and higher will get a boost.

A less expensive alternative is ISDN—which stands for integrated services digital network and carries voice analog signals and data digital signals. ISDN has been around for years but hasn't made much headway. It

uses today's copper wire and requires changes to switching equipment that don't interfere with the existing analog service. When ISDN comes to your block, you'll have the choice of changing phones to use it or keeping the old analog equipment and dealing with today's modems. ISDN can manage up to 144 kilobits per second.

The widespread availability of ISDN will make a host of new features available.

For example, at CheckFree, the bill-paying service, voice-messages could guide you through the system's on-line menu options.

Bell Atlantic and AT&T have begun a test over ISDN lines of large databases that include FM-quality audio and TV-quality video. The experiment compresses the video and works over a line that could be used to make phone calls at the same time.

Several months ago, I saw a demonstration of Prodigy running at 9,600 bps. I was able to switch from one database to another so quickly that it felt as though that mammoth database were installed on the local hard disk.

Prodigy says that 9,600-bps support will only be feasible in every home when the upgrade to ISDN is complete. That's not because Prodigy needs to use any of ISDN's additional services; it's because weak phone signals in many homes can't run at 9,600 bps, even with error-checking in hardware.

The real obstacle to getting better phone service is government. State regulatory boards keep a tight reign over local phone company budgets and could block the needed investment. The FCC's announcement could help change the political climate.

First Sub-Mini Hard Disk

Smaller computers require even smaller components. Last January, members of the Small Form Factor Committee promised to make sub-miniature hard disks, agreeing on a platter size of 1.8 inches, down from the already diminutive 2.5 inches.

At half the size and weight of 2.5-inch disks, 1.8-inch disks will be used in sub-notebook, hand-held, and palmtop PCs. *Intégral* Peripherals, a member of the SFFC, is the first to make good on the new spec. Other disk makers on the committee—IBM, Conner Peripherals, Quantum Corp., and Seagate Technologies—are all expected to ship sub-mini disks by the middle of 1992.

Intégral was founded in 1990 by former executives of *Prairie-Tek* Corp. *Intégral*'s 20MB, single-disk Mustang 1820 weighs only 3.3 ounces with a 2-inch case; a 40MB dual-platter version, the Stingray 1842, will be available to notebook makers in mid-1992.

Both *Intégral* drives have been ruggedized to stand up to the pounding of users on the go. And when it comes to power



Intégral Peripherals is first to market with a 1.8-inch sub-mini hard disk for laptops, shown here actual size.

consumption, the Mustang 1820 is a miser, using only half a watt in power-saving mode and 15 milliwatts in sleep mode, making it ideal for battery operation. Both drives use an IDE interface, with average access time under 20 ms.

Although Epson has demonstrated an *Intégral* drive in a prototype 386SL-based pen system, products using the sub-mini disks have not yet been announced. We expect to see many before 1992 is over.
—Christopher Barr

IBM and Intel

CONTINUED FROM PAGE 29

customer happy while gaining a world-class manufacturing partner. Intel has already seen how IBM can improve on one Intel design: For the new PS/2 Ultima, IBM sped up the standard 20-MHz 386SX chip with an on-chip 8K internal cache. Most important to Intel is the boost the deal gives the x86 architecture, which includes the venerable 8088 and 80286 as well as the newer 80386 and 80486. As the industry has standardized these chips, the rate of innovation has gone down. By integrating more functions onto the chip, Intel hopes systems vendors will use the freed-up space on the motherboard for such product-differentiating features as multi-

media, speech, and pens.

So far the rest of the industry is treating the joint venture as business as usual. Compaq, Dell, and Epson—all Intel customers and IBM competitors—see Intel's new contract with IBM as just an extension of the relationship that has always existed between the two companies, including, they say, the several-month head start.

These systems vendors are looking forward to the new chips, especially in low-end systems, although Dell questions the benefits of integration in high-end PCs, where functions such as video are used to differentiate products. Apple views the new IBM-Intel deal as a positive shift away from commoditization for the whole industry.—MKF

Trends

CEOs Pick Key Technologies For 1992

We asked ten industry executives to name the single most important new technology for PC users in 1992—MKF



Integrated communications will be for the 1990s what graphics was for the 1980s. As personal communi-

cations, notebooks with communications will let you take information wherever you go and get information wherever it resides.

John Sculley
Apple Computer Inc.



Object-oriented technology will have as great an impact on software as the integrated circuit had on hardware be-

cause it solves a very real problem for today's complex applications. With object orientation, programmers can design a software application with groups—or "objects"—of code, which are more reliable and reusable. For end users, object-oriented technology allows for a more intuitive and easy-to-use user interface.

Philippe Kahn
Borland International Inc.



Multimedia is a major breakthrough for users—more than evolutionary technologies such as color note-

books or improvements in performance. In business use, it will take a while to become a major factor but by providing the flexibility of integrating data, audio,

and video, multimedia expands the possibility of computing.

Eckhard Pfeiffer
Compaq Computer Corp.



Wireless computing means you won't be chained to the desk anymore. PCs out in the field using wireless communications will give users access to data wherever they are. Other important things are happening in communications: chip sets with both Ethernet and Token-Ring, peer-to-peer LAN supporting Windows 3.1, and portables with networking adapters.

Michael S. Dell
Dell Computer Corp.



By exploiting today's advanced 32-bit technology, desktop users can experience a noticeable boost in performance with new 32-bit applications, and have the ability to enhance their existing DOS, Windows, and 16-bit OS/2 applications—all running side by side on their PC desktop.

James A. Cannavino
IBM Corp.



Computer-supported collaboration. Being able to tap on-line video, audio, and text databases and work with each

other using our computers in real time, with user-friendly support, will allow us to achieve just-in-time business.

Andrew S. Grove
Intel Corp.



Networked applications, or groupware, previously disconnected users together to enhance productivity. The keys

are communications and database technology, common specifications, and mail-enabled applications.

Jim Manzi
Lotus Development Corp.



Wireless communications, pen-based computing, multimedia, high-performance graphics—they're all important new technologies. But they need rich integration. We're seeing a renaissance in applications, but if each innovation needs a whole new set of applications, the impact will be nil. So powerful system software is important because it allows these innovations to come together.

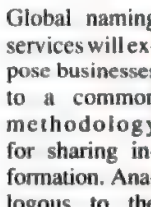
William H. Gates III
Microsoft Corp.



Object-oriented programming will be a key paradigm because it lets you develop mission-critical customized ap-

plications. Applications that used to take two years to develop now take 90 days. And they're more reliable, more complex, and have more interoperability with off-the-shelf software.

Stephen P. Jobs
NeXT Computer Inc.



Global naming services will expose businesses to a common methodology for sharing information. Analogous to the Yellow Pages, global naming services will allow corporations to interconnect through published directory addresses.

Raymond J. Noorda
Novell Inc.

Top 15 Software Sellers at Retail

Windows 3.0
Microsoft Corp.

QEMM-386 6.0
Quarterdeck Office Systems

ProComm Plus 2.0
Datastorm Technologies

Quicken 5.0
Intuit

Calendar Creator Plus 4.0
Power Up Software Corp.

The Norton Utilities 6.01
Symantec Corp.

pcAnywhere IV
Dynamic Microprocessor Associates

Microsoft Office for Windows
Microsoft Corp.

Quickpay
Intuit

Direct Access 5.1
Fifth Generation Systems

Carbon Copy Plus 6.0
Microcom

Prodigy Start-Up Kit 3.1
Prodigy Services Co.

PC Tools Deluxe 7.1
Central Point Software

The Norton Desktop for Windows
Symantec Corp.

Microsoft PC Works 2.0
Microsoft Corp.

The list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending November 1. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and cannot be interpreted as a picture of the entire software market.

Sales information compiled by Ingram-Micro

BRIEFS

■ "No taboos here anymore," says new Compaq CEO Eckhard Pfeiffer, who is "getting rid of the self-imposed barriers of the past and opening up the possibility of all levels of distribution, including mail-order." Since late October, when the board put him in the seat previously occupied by Compaq cofounder Rod Canion, Pfeiffer has already begun to knock down old walls: Notebook prices have been slashed by 25 percent; GE and TRW have been signed on to strengthen Compaq's service offerings; a value-added reseller (VAR) program has been launched; plans to develop a low-end product line have been announced; and a new management team has been named.

■ Adobe Type Manager on a chip really ought to be the name of the new Adobe Type 1 Coprocessor, which speeds up the displaying and printing of fonts. Adobe has begun licensing the chip to vendors of printers and controller cards. Users should see products that use the chip sometime in 1992.

■ Fax boards may finally become useful for receiving as well as sending faxes. Delrina Technology is releasing a new version of its WinFax software that incorporates character recognition. Eventually Delrina, which agreed to acquire OCR Systems and Non-linear Technology in November, plans to integrate character recognition into its *PerFORM* forms package.

■ Separate homes have been found for the word processors left behind by the breakup of IBM's Desktop Software business unit: Xyquest Inc., makers of XyWrite, has taken back *Signature*, which it developed jointly with IBM, and IBM's Office Systems has adopted *DisplayWrite*.

■ With Eastman Kodak's help, Novell will develop document imaging services for the NetWare network operating system.

Color Notebooks

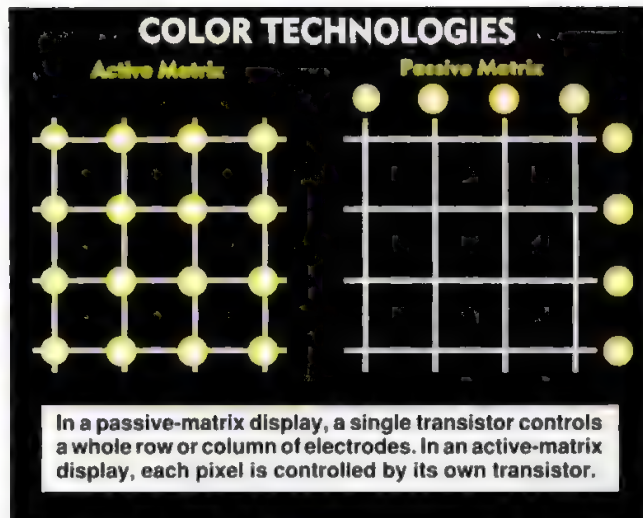
CONTINUED FROM PAGE 29

glass that sandwich the liquid crystals. A single transistor is responsible for controlling an entire column or row of electrodes. When a charge is sent to the electrode, the liquid crystals twist and allow light to pass through. To add color, a filtering system of red, green, and blue is added to the glass. Another not-so-handsome byproduct of passive displays is crosstalk—the ghosting caused by applying a charge to an entire row, as opposed to a single pixel.

ACTIVE MATRIX:
Fast, Pretty, and Expensive

Betting on a long-term strategy, Epson, NEC, and Sharp are developing more expensive, higher-quality active-matrix units costing upwards of \$5,000. See First Looks for a review of the first color notebook, The NEC UltraLite SL 125C. Active-matrix screens deliver up to 512 colors before adding a video controller, offer a wider viewing angle, and brighter, sharper colors.

In the active-matrix design, each pixel, not just a row of pixels, is controlled individually—giving it a faster response time. The displays are sharper and can have a greater palette of colors—with no crosstalk. The contrast ratios (the difference between black and white) for



active screens are 4 to 10 times greater than passive ones—translating into brighter, crisper images.

Notebook makers are choosing between two types of active matrix. TFT screens (thin-film transistors), used by NEC and Sharp, are based on transistors; MIM (metal-insulator-metal) screens, made by Epson, use diodes.

MIM displays cost less than TFT because they are made up of fewer layers, and diodes are easier to etch than thin-film transistors. But since transistors switch on and off more rapidly than diodes, TFT screens are faster and have more vibrant color.

The manufacturing process for TFT displays remains a serious hurdle. While the yield rate continues to improve, only about

20 percent of all the TFT screens now manufactured work. If any transistor in the display malfunctions, a dead "dot" will be visible.

Presumably, active-matrix will ultimately become the de facto color computing technology, but it won't happen until prices drop and manufacturing yields increase.

The prognosis for lower prices isn't helped by the 63 percent import duty for active-matrix panels recently imposed by the U.S. government, especially since there are only a few small manufacturers of active-matrix screens in the U.S. and they mostly produce LCD projection panels. Ironically, some color notebook makers will avoid the tariff by building the entire machine overseas.—CB

MPC Council
Reconsiders Spec

The Multimedia PC Marketing Council may be rethinking the minimum hardware specification for an MPC. With much fanfare and support from 40 software companies and 30 hardware vendors, the MPC logo was launched last October to promote the council's hardware specifications for multimedia computing. But earlier last fall, the council had set up a technology committee, which is reviewing the technical specs for the standard MPC platform: a 10MHz 286 with 2MB of RAM,

30MB of hard disk space, VGA, 8-bit audio, a CD-ROM drive, and Microsoft Windows 3.0.

The 12-member MPC Council—which includes CompuAdd, Philips, Tandy, and Microsoft—kept the standard deliberately low to protect the current installed base and recruit small- and home-business users. But now the Council may be conceding to what users and developers already know: that the entry-level platform doesn't have enough power to do reasonable multimedia applications.

That's certainly the message delivered by IBM, which is poised to launch its more ambitious PS/2 Ultimedia Model M57 with XGA graphics, fast-cached 386SLC, and CD ROM XA drive (which exceeds the CD ROM specification by interleaving audio and video).

The MPC Council will have a tough job balancing its desire for a more powerful platform at a price low enough for home users, and the promise of compatibility. If the whole point of the MPC logo is to make it easy for consumers to identify hardware and software products that will work together, coming out with an "MPC Level 2" in a few months may muddy the waters. —MKF

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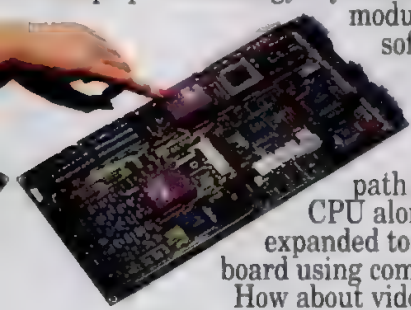
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First Looks

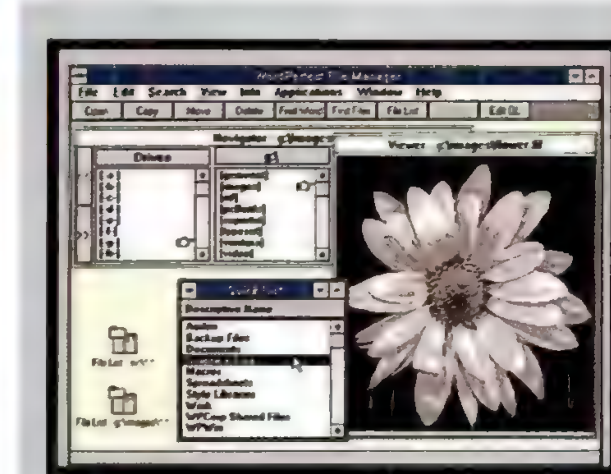
Hands-on Reviews of the Latest Products

WordPerfect for Windows: A Character-Based Powerhouse All Dressed Up for Windows

HANDS ON
by Edward Markey

WordPerfect 5.1 for Windows gives you all the familiarity of *WordPerfect* for DOS while adding the convenience of a graphical environment and the best file manager you can buy for either Windows or DOS. *WordPerfect Corp.*'s \$495 package includes virtually all the functions in the DOS version and uses the identical file format and printer drivers. You don't have to import or convert files when switching between versions; you use the same files and get exactly the same results on the page. The \$99 upgrade includes a license that lets you use both DOS and Windows versions on one machine.

If you have a network full of *WordPerfect* files, the Windows version lets you edit them more easily than ever. As in other advanced Windows word processors, you can open nine



WordPerfect's splendidly flexible file manager lets you open or iconize "navigator" directory windows, detailed file lists, viewers, and customizable "quick lists" that can refer to any filespec or directory you choose.

files at once and create DDE links with other Windows applications. Links created in the Windows version are dormant when you edit a file in the DOS

version, but the data remains in the document. On-screen, a button bar lets you assign commonly used functions to buttons that can display either icons or de-

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scriptive names or both.

An optional ruler lets you adjust margins, tabs, and column and table widths and has icons for other basic formatting. You can resize tables only from the ruler or a menu—not interactively from inside the table, as you can in WP's DOS version. Unlike *Ami Pro* and *Word for Windows 2.0*, the program lets you move or resize graphics frames but offers no tools for creating a drawing.

WP for Windows offers the best file management of any
CONTINUES ON PAGE 38

Freelance Graphics for Windows: Presentation Software with Staying Power

HANDS ON
by Rick Miller

Each entrant in this year's parade of presentation graphics programs has had its moment in the limelight. *Lotus Corp.*'s *Freelance Graphics for Windows* seems destined for more permanent celebrity status. With plenty of power in an exceptionally well-designed pack-

age, this \$495 presentation graphics program is simply the best on the market for the time-pressed business user.

Freelance Graphics for Windows' basic design adheres to the now-familiar metaphor inaugurated by *Microsoft's PowerPoint* and *Aldus's Persuasion*. You can choose between an outline (which resembles a yellow legal pad) for

composing the text of a presentation, a single frame for detail work, and a multislide light-table for sorting. These views are linked, so any changes that you make in one will automatically appear in the other.

The program has an exceptionally well-designed and responsive interface. Its customizable icon toolbar puts exactly the tools you need within easy reach; most functions are also accessible from menus and (where applicable) by double-clicking on objects; attributes of any graphic object are set simply by double-clicking on it.

A gratifying degree of attention is paid to the little details of usability. On-screen buttons, for instance, give you instant access to a title sorter and a list of page layouts, and you can select the tool and the object in either order. Help is available in dialog boxes as well as menus, and a bit of help text pops up as you pass over a menu entry or an icon.

When it comes to charting and drawing, *Freelance* doesn't shirk its responsibilities. You can select a full complement of 2-D and 3-D business charts
CONTINUES ON PAGE 39

First Looks

WordPerfect for Windows

CONTINUED FROM PAGE 37

Windows program. A "quick list" feature lets you define a directory or filespec by a descriptive name, then click on it to call up the list of associated files. A customizable file manager can run from inside the word processor and display graphics in their native format, limit searches to multiple words in the same line, paragraph, page, or file, and launch applications.

You use essentially the same method to format text in both versions. Instead of selecting multiple paragraphs and applying styles or direct formatting (as in other Windows word processors), you position the cursor at a paragraph and enter format codes that apply until another code changes the format.

You still must open a "Reveal Codes" window to determine the content and placement of these codes or to move and delete them. One definite improvement is the option to position codes automatically at the start of a paragraph or page and replace any existing code for the same function. Still, styles aren't the convenient way of applying formats that they are in *Ami Pro* and *Word* for

Windows.

The program's default keyboard uses standard Windows keystrokes; the other layout imitates most keystrokes of the DOS version; submenus always use Windows keystrokes. You can also create your own layout. Both keyboards let you select text by using a function key to turn on a Select mode; you can also select text by the Windows methods of clicking and dragging or pressing Shift and using the cursor keys.

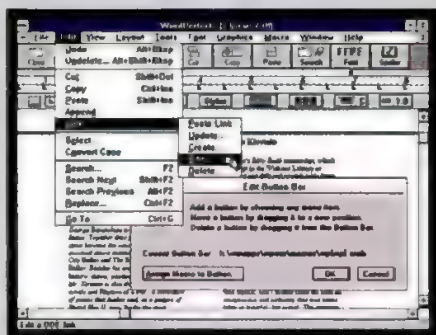
Confusingly, when you use Select mode, the selection extends to the next character you type, but if you use Windows-style selections, the next character you type replaces the selection. (*Word for Windows* works the same way, but lets you turn off the typing-replaces-selection behavior.)

The WP Windows screen takes only partial advantage of

the GUI environment. You can't zoom on the editing screen to make small fonts more legible, but you can switch to a draft mode similar to the DOS version's editing screen—right down to the monospaced font and long lines that scroll off the edge.

As in the DOS version, an editing window takes over when you create or edit headers, footnotes, equations, or captions, and when you open an ineffective graphics editor to crop or rotate images. An uneditable print preview displays the full page or facing pages (with non-WYSIWYG screen fonts) and lets you zoom in for a closer view.

You can switch between the DOS version's printer drivers and standard Windows drivers. If you want flexibility and speed, stick with the *WordPerfect* drivers, but you'll only be



WordPerfect for Windows lets you customize its button bar by dragging menu items to the bar itself. You can also assign macros to the button bar or keyboard.

FROM WP DOS TO WP WINDOWS: Should You Switch?

If you're considering switching from DOS *WordPerfect* to the Windows version, keep some advantages and disadvantages in mind.

Advantages: The Windows version opens nine files instead of two, and gives you a button bar, clearer CUA menus, and unmatched file management. You can draw lines and boxes with a mouse, and move imported graphics on-screen. The ruler makes most format changes intuitive and inter-

active. Columns are easier to work in. You can share data with other Windows programs via DDE. Fewer format codes clutter your files. You get Undo and three-level Undo. You can select edited files from a menu, and add macros to a menu.

Disadvantages: You still don't get an editable full-page preview. With 10-point or smaller fonts you may have to switch to draft view—which is like switching back to DOS *WordPer-*

fect. Table formats are harder to modify than with DOS. You lose the Repeat function and in-document math from the DOS version (math still works in tables). You can't work gradually up and down in menu levels as you can under DOS. You don't get the stability or speed of the DOS version. Keyboards and macros written for the DOS version have to be rewritten. (For a macro conversion service, call Milam Enterprises, 214-823-9837.)—EM



FACT FILE

WordPerfect 5.1 for Windows

WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057; 800-451-5151, 801-225-5000.

List Price: \$495; upgrade from any DOS version, \$99.

Requires: 2MB RAM (4MB recommended), Windows 3.0.

In Short: The obvious choice for upgrades from DOS *WordPerfect*. *WordPerfect* for Windows shares files and printer drivers with the DOS version—something no other program can claim. However, its screen display is less WYSIWYG and less flexible than those of *Word* for Windows or *Ami Pro*.

CIRCLE 704 ON READER SERVICE CARD

able to use *Adobe Type Manager* fonts as screen fonts—and only if they match your printer fonts. The Windows drivers let you use *ATM* fonts as both printer and screen fonts.

A new macro language is completely incompatible with the DOS version, and a supplied converter works only with the simplest possible text-entry and cursor-movement macros.

In most editing and formatting tasks, *WordPerfect for Windows* can't match the jack-rabbit speed of the DOS version. It's also slower than its major rivals, *Ami Pro* and *Word* for Windows, and doesn't offer their collapsible outlining.

The first release suffers from bugs and UAEs that will probably disappear from an interim release early in 1992. When the Windows version loaded a test file so complex that only DOS *WordPerfect* could have created it, it gave up halfway through, and then sometimes locked the system.

WordPerfect for Windows doesn't feel fully at home in its GUI environment. But for sharing files between DOS and Windows—and all other major platforms—nothing else comes close. Its limitations derive from the DOS version and won't bother users of the DOS version. Everything added for the Windows version—such as the matchless file manager—is unsurpassed.

First Looks

Freelance Graphics for Windows

CONTINUED FROM PAGE 37

from a visual gallery. The default designs are exceptionally clean and attractive; you can customize practically every aspect of them.

SMARTMASTER DESIGNS

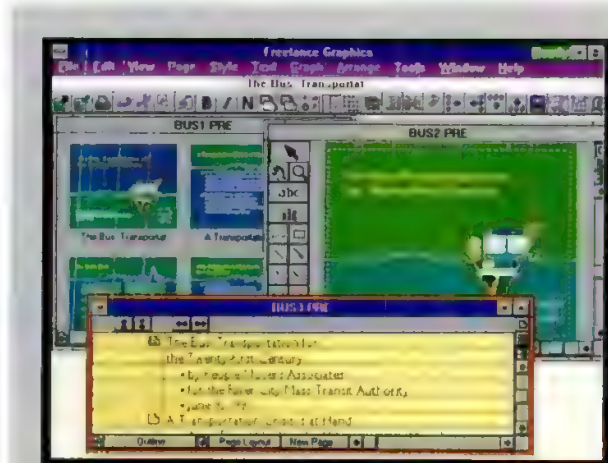
At the heart of *Freelance Graphics for Windows*' presentation capabilities is the innovative "Smartmasters" concept developed for *Freelance Graphics for OS/2*. There are 63 professionally-designed Smartmasters and a blank "custom" Smartmaster that you can use to build your own.

Each Smartmaster offers an entire suite of page layouts: one- and two-column word charts, horizontal or vertical graphs, blank layouts, and so on. You simply pick the one that fits the type of information on your slide. The basic layout sets consistent title, background, and color specifications for all the master pages.

One unique twist to Smartmasters is its snappable "placement block," which automatically resizes charts and graphics so they remain consistent in size and aspect ratio. If you later want to rescale these elements throughout your presentation, you simply change the size of the placement block.

Each Smartmaster has a default color scheme, but you can transform the mood of the presentation by selecting a new 18-color palette. Three of the colors are reserved for text and three for backgrounds. The palettes also make it easy to proof your presentations by letting you switch to a black-and-white or gray-scale image.

Each palette is composed of a selection of colors from a 256-color library. Library colors do not change when you switch palettes, so you can use them for clip art and logos knowing that the colors will remain stable. Though you can use only 256



Freelance Graphics for Windows offers many ways to work. Choose a thumbnail story board, a single frame, or an outline view. Smartmaster gives a presentation consistency.

colors out of the 16.7 million supported by Windows in a single presentation, this is less of a handicap than you might suppose. Gradient fills, for instance, are composed of as many intermediate shades as your output device can support. And though you can't use the 24-bit TIFF files, you can use 8-bit indexed color bitmaps, even adjusting their brightness and contrast.

Though Smartmasters are more complicated to customize than the simple backgrounds or master pages of other packages, they are worth the trouble. By using a suite of familial layouts, they help you to avoid that generic feeling while at the same time assuring consistency of type and color treatment.

ROBUST CHARTING

When it comes to charting and drawing, *Freelance* doesn't shirk its responsibilities. You can select a full complement of 2-D and 3-D business charts from a visual gallery. The default designs are exceptionally clean and attractive; you can customize practically every aspect of them.

Freelance's text handling within charts is excellent: labels are scaled relative to the chart, and long chart labels can be word-wrapped, staggered, or rotated. The only serious limitations are its inability to vary line widths continuously (there are just eight fixed widths) and to

move chart legends interactively.

Though *Freelance* has a basic internal data sheet, it really shines most when it links to data files on disk. Creating a link is flexible and easy: You open up a window into your data file and mark off the ranges that contain data, labels, and so on. Links can be updated either automatically when you reopen the presentation, or manually. The data is stored in the chart file so that you can unlink the chart from the data file at any time.

You can import *Lotus 1-2-3* and *Symphony* worksheets and graphs; .DBF, .SYLK, and ASCII text formats are also supported. The data window can act as a client for OLE and DDE Paste Links from *Excel* and other Windows applications.

The program's file export facilities are limited. Only .WMF, *Freelance* .DRW, and (ANSI) CGM files are supported. There's no way to export images as bitmaps, except through the Clipboard. On the other hand, the quality of the exported files is good. Our tests showed none of the sizing and object translation problems so common with the CGM format.

Complete drawing and annotation tools include full Bezier-curve editing and gradient fills on objects. *Adobe Type Manager* and two attractive Monotype fonts are bundled with the program. The symbol tool, which is used to place clip art, offers a thumbnail preview.

The included clip art is mediocre both in range (there are only 500 images) and quality, but you can purchase *Lotus's SmartPix* program (2000 additional symbols), and you can import third-party art in .WMF format. The program also acts as an OLE client and server for embedded graphics.

Freelance is useful with just about all major output devices, including film recorders. A coupon for an Autographix slide service driver is included in the box; the program also supports Windows drivers from MAGI-corp and Genigraphics. Unusual among its peers, it has a full standalone screen show. You can export presentations in *Lotus's* .SHW and .GX2 formats and view them using only a DOS-based utility.

The program is not perfect. Double-clicking on text with the select tool pops up an attribute box instead of letting you edit the text, and there are no rulers for the entire image, so creating images for export purposes is a matter of trial and error. Finally, there is no option to install the program without the full complement of symbols, tutorial, and Smartmasters.

These complaints cannot dim *Freelance Graphics for Windows*' extraordinary luster. Marrying first-class presentation management with top-of-the-line charting and drawing tools, it's a program that doesn't ask users to compromise. ■



FACT FILE

Freelance Graphics for Windows, Release 1.0

Lotus Development Corp.,
55 Cambridge Pkwy.,
Cambridge, MA 02142; 617-
577-8500, 800-343-5414.

List Price: \$495.

Requires: 2MB RAM (4MB recommended), hard disk (10.5MB space required), DOS 3.1 or later, Windows 3.0 or later, mouse.

In Short: Powerful and flexible charting and drawing tools combined with first-rate presentation capabilities make *Freelance Graphics for Windows* a premier choice in a crowded field.

CIRCLE 799 ON READER SERVICE CARD

First Looks

First Active-Matrix Color in a Laptop Dazzles

PREVIEW
by Christopher Barr

NEC is about to make the future of portable computing a whole lot brighter. The UltraLite SL/25C is the first active-matrix TFT (thin-film transistor) color notebook available, and its price tag rivals lower-quality passive-matrix offerings.

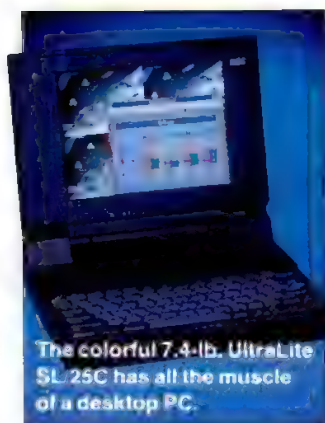
The 7.4-pound UltraLite SL/25C has more going for it than just spectacular color. It's also one of the first notebooks to use Intel's new 25-MHz 386SL chip set. The \$5,999 machine comes standard with 2MB of RAM (10MB maximum), an 80MB hard disk, internal floppy disk, 64K RAM cache, DOS 5, and Windows. Street price should be around \$5,000.

The UltraLite SL/25C's color screen rivals the quality of your desk-bound monitor. Unlike a CRT screen, which focuses an image onto the screen, the active-matrix pixels are hardware elements, so they are always in sharp focus.

The SL/25C has a 640-by-480 resolution with 16 colors and a 256,000-color palette. Like the other active-matrix color notebooks that will soon be available, it displays 256 colors, but only at 320-by-200 resolution. (See related story in this issue's Trends column.) The external VGA adapter can power a display simultaneously, or drive an 800-by-600 monitor when the LCD is disabled.

Although active-matrix panels generally require more (and more powerful) backlights than monochrome screens do, NEC fit the color screen into the same case as its monochrome version and added only a quarter of an inch to the unit's height.

Using the latest SL chip set from Intel for power management, the UltraLite SL/25C is rated to last 1.5 hours using a nickel cadmium battery. The preproduction unit we tested hadn't yet been optimized to take advantage of the SL chip; it managed 1.25 hours on PC Magazine Labs Battery Run-



The colorful 7.4-lb. UltraLite SL/25C has all the muscle of a desktop PC.

down benchmark test.

The setup program by NEC lets you dictate the power-saving levels. Under battery power, the SL/25C has three states: idle, rest, and standby, which use 30, 80, and 96 percent less power, respectively.

The unit has a full complement of ports—serial, parallel, PS/2 keyboard, PS/2 mouse, keypad, external floppy, VGA, and docking station ports. RAM upgrades are proprietary modules and an optional modem or fax/modem can be installed internally. The unit supports a math coprocessor as well.

Since we tested a preproduction unit, we won't print benchmark test results, but we will say that the UltraLite SL/25C

performed comparably with a 25-MHz IBM PS/2 Model 70. With NEC's 64K cache and the 386SL chip set, the hard disk results were exceptionally good.

The video tests were equally impressive. The screen is very fast with bright, vibrant colors. The viewing angle is about 75 degrees, which means you don't have to sit directly in front of the screen to view it the way you do with many passive-matrix machines. Our testing also uncovered a bug in the Cirrus Logic VGA controller, which we expect will be fixed when the SL/25C ships this January.

But the wonderful color screen didn't blind us to the UltraLite's shortcomings. Foremost is the keyboard: It has 78 keys and the function keys are cramped. The half-sized cursor keys serve double duty as PgUp, PgDn, Home, and End keys, which is very inconvenient. If color notebooks are truly going to replace desktops, the keyboards *must* improve.

The UltraLite also comes up short in battery life. The Intel 386SL chip set can manage power usage, but it can't reduce power consumption. To increase battery life, NEC must further reduce the power used by the most guilty components—the hard disk and LCD screen.

At 7.4 pounds, the UltraLite SL/25C isn't exactly light, and \$6,000 is not fast cash. But with a superb color screen and a fast hard disk, this notebook heralds the beginning of the new laptop: active-matrix color, battery operated, and power conscious. ■

NEC TODAY, OTHERS TOMORROW

Sharp, Seiko-Epson, Sanyo, and Display Technologies (a joint venture between Toshiba and IBM Japan) all manufacture color LCD panels. NEC won the race for first to market, but it won't be alone for long. For a number of reasons, the time is right for active-matrix display technology to hit full force.

Why? First of all, there's been a tremendous advance in backlighting technology. NEC uses low-powered, very thin (4.1-mm. diameter) backlight tubes. The screen uses only 7 watts of power at full brightness—one third the power that ac-

tive-matrix panels required a generation ago. (Monochrome LCDs generally require less than 5 watts.)

Techniques for etching diodes onto the display screens have also improved. Active-matrix TFT screens are far more difficult and more expensive to manufacture than passive screens (so you pay more), but they look better. A 640-by-480 active-matrix screen has a transistor for each pixel on the display screen—some 921,600 transistors etched onto the glass. In essence, your display is a 9.4-inch diagonal chip.

Another reason TFT screens are so expensive is

the low production yields. While the industry yield on panels hovers at 20 percent (much improved from the last generation), NEC claims a yield upward of 50 percent, which translates into a lower cost per panel.

But a price war is now brewing. While the first color notebooks out in January will be in the \$5,000 to \$6,000 range, by summer the market should be crowded, and the prices lower. And though passive-matrix laptops will have their day in the sun as the least expensive point of entry, active-matrix laptops are the way of the future.—CB



FACT FILE

UltraLite SL/25C

NEC Technologies Inc., 1414 Massachusetts Ave.,
Boxborough, MA 01719; 508-264-8000, 800-632-4636.

List Price: With 2MB RAM, 80MB hard disk, 1.44MB 3.5-inch floppy disk, DOS 5.0, Windows 3.0, \$5,999. Data modem, \$335; fax/modem, \$585; docking station, \$999.

In Short: The first active-matrix notebook to bring color to battery-powered PCs.

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*Contact QMS for availability of network options.

*Patent pending

First Looks

Intuit and MECA Add New Twists to Personal Finance

Quicken for Windows, Quicken 5.0

HANDS ON
by Bill Howard

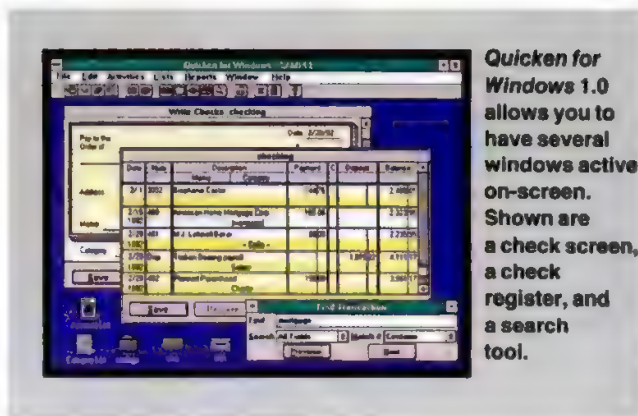
With the fifth release of its DOS-based personal-finance program and its first version for Windows, Intuit's *Quicken* family continues to stand its ground as the most thorough, most comprehensive checkwriting programs you can buy. Of the two, *Quicken 5* (the DOS product) offers more features and robustness than *Quicken for Windows 1.0*, although you wouldn't know it by all the publicity surrounding the Windows entry and the oh-by-the-way nod to the DOS product.

Quicken for Windows turns out to be slightly easier to use than DOS *Quicken*—but perhaps not quite as easy as Microsoft's *Money* (see First Looks, November 26, 1991). All three programs list for \$69.95 (a \$10

increase for the Intuit products), actually sell for half that, and carry an upgrade price of about \$20, so cost is no issue with any of them.

All three products are built around the now-obvious (in retrospect) idea that people hate balancing checkbooks and want software that lets them spend the least time, not the most, managing their money. While most people *know* they should have a net worth statement, buy life insurance, and create a household inventory for insurance purposes, they hate preachy personal-finance software that nags. In this regard, *Quicken* and *Money* differ significantly from 1980s editions of MECA's intensely complete, intensely complex *Managing Your Money*, and a bit from the most recent, more relaxed Version 8.0 (see related story).

Both new *Quicken* products provide a more robust set of features than *Money*: CheckFree electronic bill payment (\$9.95 a



Quicken for Windows 1.0 allows you to have several windows active on-screen. Shown are a check screen, a check register, and a search tool.

month for 20 checks), true investment tracking, two-level passwords (the second level so no one can tamper with old data once it's reconciled), the ability to memorize and recall commonly used reports, and a tax-schedule list that translates your categories into IRS Form 1040 (and related schedules) categories. There's also a new wallet check style for laser printers that's far less likely to come back from the bank mangled than the 8.5-inch-wide business checks that had been the only choice for laser printer users.

QUICKEN FOR WINDOWS

If you've used the DOS product before, you'll be on familiar ground with *Quicken for Windows*. Many of the commands and shortcuts work the same way (Ctrl-W to write checks, for instance), the file structure is the same as *Quicken 5*, you use the same categories-and-classes structure to track your expenses, and your most common views are on-screen replicas of paper checks and checkbook registers.

There are, of course, significant differences—mostly, but not always, for the better. The biggest advantage lies in your ability to have multiple windows and even multiple accounts open at the same time, either as windows or as already-loaded icons, using the Windows Multiple Document Interface (MDI). Changes in one account show up immediately in related accounts. You can customize your desktop and return to it the next time you load *Quicken for Windows*.

You might want to take ad-

vantage of the multiple-window abilities this way: You'd have a checkwriting window open for bill paying, a smaller window showing your list of memorized transactions (bills you pay frequently), and another small window showing your expense categories. In order to write a check, you could double-click on the payee's name in the transaction-list window and it would be transferred automatically to the checkwriting window. That's what gives the Windows version its ease of use. Users who want to play Price Waterhouse at home can use Microsoft's DDE (dynamic data exchange) to further manipulate their data in *Excel*. Oddly, neither *Quicken* nor *Money* has the ability to save a file in *Lotus 1-2-3* or *Excel* formats, except through painful manual translation.

There's an icon bar for 15 common operations, but the icons aren't very clear. A scale and a magnifying-glass are easy to understand: Reconcile (balance) and Find. But see if you can figure out what these represent: a telephone handset and what looks a light bulb, three cascaded rectangles, a thick horizontal bar with a half-circle above it, and a rectangle with two horizontal bars inside.

In order, they are: Category list (the phone and electric companies), Memorized transaction list, Security list (the icon is a briefcase handle), and Write checks.

Impressive as it is, *Quicken for Windows* bears some marks of a product that came to market without being fully thought

CONTINUES ON PAGE 44

PERSONAL CHOICES

Elsewhere in this issue, *Microsoft Money* was chosen as one of the Editors' Personal Best products of 1991. Neither *Quicken* product shipped in time to qualify, but let's play what-if—they-did for a minute:

DOS-based *Quicken 5* is a reworked version of a product that's won twice in the past (1988, 1989), and while the improvements are somewhat modest, Editors' Personal Best celebrates best-of-breed products, not best all-new products. *Quicken for Windows* clobbers *Money* on features, but *Money* has a slight advantage on less-is-more simplicity. Given their various

strengths, it might have been a three-way tie.

If your needs are simple, you'll be especially happy with *Money*. Individuals who track investments or want to pay bills electronically should get one of the *Quickens*; small businesses should also, and stick to the DOS version if they're doing payrolls. Those who want more than checkwriting—a total personal finance package—should consider *Managing Your Money*.

Quicken users might consider getting both upgrades: the DOS one for robustness, the Windows one for better report writing. Both use the same data format.—BH



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First Looks

Quicken

CONTINUED FROM PAGE 42

through. Many users will find the Helvetica-like screen font too small for legibility (*Money* has the same flaw), and it can't be made larger. When you do a search, the located item is poorly highlighted.

An inadvertent mouse-click when moving among windows might undo or misapply an operation; click on your partially hidden check-reconciliation window and the mouse-click might mark an uncleared check as cleared. (Windows etiquette holds that the first click on a partially hidden window should activate it, and the second click should perform some operation.) The AutoRecall feature that lets you type the first few letters of a transaction and press Tab for automatic fill-in can mess up and choose the wrong transaction without warning you. Finally, a half-dozen features added to *Quicken 5* aren't included.

QUICKEN 5

The "what's new" part of *Quicken 5* is for the most part fine-tuning, rather than breath-taking new features, and that's what you would expect from a product that has been essentially perfect for most of its seven-year life: features such as support for expanded memory (EMS 4.0), a mouse, and PostScript printers (but in fixed-pitch fonts only). The menu bar across the top is now SAA-compliant (SAA is IBM's Systems Application Architecture), a fancy way of saying you call a menu by holding the Alt-key and tapping the first letter (usually) of the menu item; the menu then drops down, rather than popping up as it does in *Quicken 4* and earlier.

You could always manually split a transaction into fixed dollar amounts; however, now you are enabled to split it by percentages, whatever the total (example: two roommates each pay 50 percent of the electric bill). You could always change dates in a date field with the plus and mi-

nus keys; now you can jump to the beginning or end of the month or year by typing the first or last letter of Month or Year. Press R once and if today is 1/14/92, the date becomes 12/31/92; press it again for 12/31/93. Not earth-shattering stuff, to be sure.

The biggest improvements in *Quicken 5* unfortunately don't work as well as they should. The loan amortizer lets you figure how much of each month's mortgage payment is principal and how much is interest, then set up a memorized transaction. But it's no good for mortgages where the bank also collects taxes and insurance, because *Quicken* can't deal with a combination of sliding and fixed amounts. If you've ever created two categories you realized later were really the same thing (Auto and Car, for instance), you can now merge them through the nonintuitive process of making one a subcategory of the other, then deleting the subcategory.

If you want to know more about the numbers behind the numbers in a summary report, QuickZoom drills down to the check-register transactions, but beware—it's a one-way trip; you can't return to the report. You can collapse long reports to see only the top-level details, but it only works for certain kinds of reports, and not all of them. Likewise, QuickZoom only works for some reports, not all of them.

Improvements to *Quicken 5* that are unabashed successes are the tutorials for new users, the easy set-up of new accounts, the ability to reconfigure reports on the fly, and Quick Keys that let

you shift among nine accounts with single keystrokes.

List Price: *Quicken*, Version 5.0, *Quicken for Windows*, Version 1.0, \$69.95 each (\$20 for upgrade). **Requires:** Windows version: 2MB RAM, Windows 3.0 or later. DOS version: 512K RAM, DOS 2.0 or later. Intuit, 155 Linfield Ave., Menlo Park, CA 94025; 800-624-8742, 415-322-2800.

CIRCLE 707 ON READER SERVICE CARD

Managing Your Money



Managing Your Money goes well beyond the scope of Intuit's *Quicken* and Microsoft's *Money*, since both stay fairly well focused on electronic checking and banking. *MYM* is designed to handle the planning as well as the bookkeeping, and Version 8.0 does more of this than previous versions.

Last year, MECA Software concentrated on updating the program's aging interface with Version 7.0. This year, the still-DOS-based, \$219.95 Version 8.0 emphasizes financial planning and analysis.

The Money section remains the core of the program. It handles traditional checkwriting, budgeting, and reporting. The section has some minor improvements, such as additional hotkey access, that make it easier and faster to enter deposits and payments.

The bulk of the new features are scattered throughout the program's other modules. The Tax module's W-4 calculator

lets you avoid an underpayment penalty and it includes the latest tax tables for 1991 and 1992.

The number of financial planning modules has been increased. In the Analyze module, a home-affordability gauge lets you plug in variables to determine how much of a home (and mortgage) you can afford. A new goal-planning feature that presents several scenarios adds a touch of calm after you've been through the rigors of the tuition- and/or retirement-planning worksheets. A new insurance worksheet helps plan needs and costs.

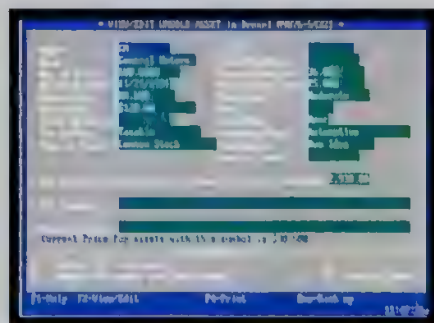
But it's *MYM*'s Portfolio section that really sets it apart from the competition by allowing you to most fully explore your assets. Though *Quicken* can track stocks (Microsoft's *Money* can't), *Managing Your Money* performs an in-depth analysis of your various portfolios. Version 8.0 has links between the Portfolio section and the Tax section. You can see how profits and losses affect your taxes, or use the link to generate "what if" scenarios.

The Net Worth module has a new asset-allocation feature. Now, in addition to seeing how your penny collection has appreciated over the years, you can do sophisticated resource allocation. You can examine your investment risk profile and compare it against historic rates. *Managing Your Money* then calculates where your money might do better, and offers suggestions.

Managing Your Money has always been geared to financial power users. The scope of the product far exceeds daily banking chores. Although the latest version is still missing mouse support, and a Windows version of the program is still in the works, *Managing Your Money* continues to appeal to those who want to fully explore their financial plans.

List Price: *Managing Your Money*, Version 8.0, \$219.95; upgrade from Version 7.0, \$49.95. **Requires:** 512K RAM, DOS 2.x or later. MECA Software Inc., 55 Walls Dr., Fairfield, CT 06430-0912; 203-256-5000.

CIRCLE 702 ON READER SERVICE CARD



MYM emphasizes financial planning with features like its portfolio analysis.

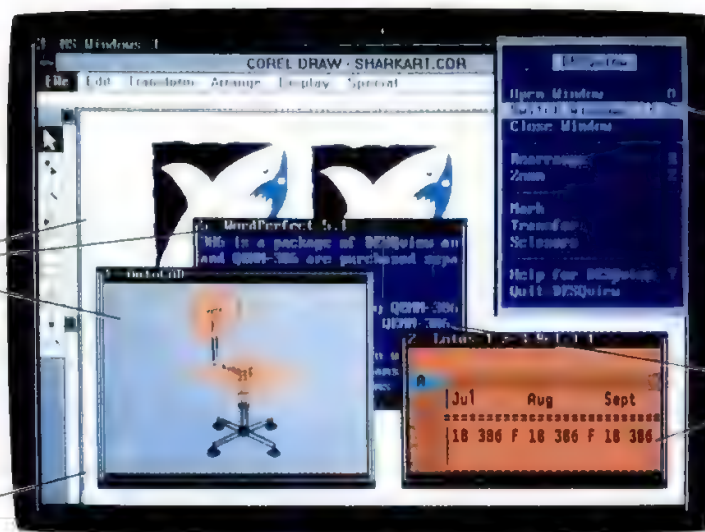
Better Windows

Solve memory problems
QEMM 386 makes the most of every last 'K'. DESQview uses that memory to run multiple programs.

Multitask
Run multiple programs side-by-side in windows. 'Background' programs can continue to run.

See text and graphics side-by-side
Reference information in your graphics program while writing your report.

Run Windows programs
DESQview even lets you run Microsoft Windows



Easy menu access to programs and DOS services

Access programs or DOS in a window with just a few keystrokes or mouse clicks. It's that simple.

See multiple files
If your programs allow it, DESQview lets you run the same program in two or more windows. Great for comparing files

Cut and paste data
Transfer data between programs with a few keystrokes.

Handle large programs
Run standard DOS programs side-by-side with DOS-extended programs like 1-2-3 Release 3.

DESQview. The Multitasking, Windowing Environment.

Once the power user's secret, DESQview has been discovered by computer knowledgeable people everywhere. Over 1,000,000 people have bought DESQview.

Multitasking; windowing, using keyboard or mouse commands, it's all easy with DESQview.

DESQview 386 2.3 lets you use your favorite DOS and DOS-extended programs in windows side-by-side on 386SX, 80386 and i486 PCs. As you can see above, you can even run Microsoft Windows



within DESQview.

DESQview 2.3 gives 8088, 8086 and 286 PCs with additional memory most of the same capabilities with surprisingly little performance trade-off.

Whatever programs you use—DOS, extended DOS or Windows—and whatever hardware you have, whether 8088 or i486 or something in between, DESQview is still the best way to get the most out of the hardware and software you own today.

DESQview. When you look into it, it's the obvious choice.

Quarterdeck

Quarterdeck Office Systems, 150 Pico Boulevard, Santa Monica, CA 90405 (213) 392-9851 Fax (213) 399-3802
CIRCLE 338 ON READER SERVICE CARD

First Looks

Jolt: Solid Ink Jet Printer "Slowly" Brings Color to Business Documents

HANDS ON
by Winn L. Rosch

Adding the color of a laser light show to the quality of a laser printer is what Dataproducts Corp. claims its Jolt printer is all about. Combining 300-dot-per-inch laser resolution with the bright, clear colors of wax-based inks used in solid ink jets, the Jolt is meant to find a middle market niche—a general-purpose text printer that can also deliver high-quality color when it's needed.

The hues and sharpness produced by the large desktop box (10 by 19.75 by 22.5 inches, HWD) are beyond reproach. But when you compare the Jolt to a typical laser printer, its price demands are high—both in speed (about two pages per minute with straight text, about half that for graphics) and in high capital cost (\$4,995 for the base model with 1MB RAM; an additional 3MB, \$749.95; 5MB, \$1,199.95). It fares bet-

ter in relation to thermal-wax printers—it's about par for the course on color cost and is more amenable to monochrome text output.

As with other ink jet printers, the Jolt uses a back-and-forth printhead that sprays one line of text on paper at a time. Unlike other traditional ink jets, it uses plain paper and hard, crayon-like inks. Four primary colors (cyan, magenta, yellow, and a pure black for text) mix on paper to give you seven pure colors and up to 4,096 hues when dithered in a four-by-four matrix.

The Jolt paints on executive, letter, A4, and legal-size cut sheets of 16 to 24-pound weight paper automatically; up to 35 pounds using manual feeding. It accepts 200 sheets in the input tray and 100 in the output.

Unlike the first generation Howtek PixelMaster solid ink-jet, Jolt is more a "process embossed" printer than a "Braille" printer. Instead of



hard dots, its output has the feel of the raised type on true engraved printing. The Jolt foregoes the cold fusing—using a steel roller to squash its wax-based ink smooth—that makes the output of its competitor, the \$9,995 Tektronix Phaser III PXi, feel flat.

Ink for the Jolt comes in easy-to-load cartridges priced at \$45 for black, \$60 for each primary, and \$179.95 for a pack of four. The dollars translate to a laser-like three cents per page for text printing, about one cent for each percent of the paper that's covered with ink when generating graphics (that means about 50 cents for 50% coverage, about the same as thermal-wax printing).

Additional maintenance includes running blotter paper through the machine. And it must be powered-on continuously to keep its ink hot (it

draws about 175 watts while waiting). It has no on/off switch.

The standard Jolt understands HP's LaserJet Series II language, PCL 4, and the HPGL plotter language. It is compatible with HP SoftFonts, but not font cartridges. The base-model includes its own Windows 3.0 driver that creates excellent pure colors, very good mimics of halftones, but somewhat dingy color dithering in 300-dpi mode. Attempts at lower resolution printing produced Unrecoverable Application Errors. A PostScript Level 2 version of the Jolt is scheduled for shipping in January 1992, priced at \$6,995.

■
List Price: Jolt, \$4,995; Dataproducts Corp., 6219 De Soto Avenue, Woodland Hills, CA 91365; 800-289-5657, 818-887-8000.

CIRCLE 701 ON READER SERVICE CARD

Apple's New LaserWriters Kiss PC Users Goodbye

HANDS ON
by Bill O'Brien

In the past, the discerning PC user often had one Apple product—the impressive LaserWriter NTX. Apple's new printers, the \$3,599 LaserWriter IIf and the \$4,599 IIG, are not as inviting for the PC user. As a matter of fact, they do everything but bear a "For Macintosh Only" sticker.

Both models supply PostScript Level 2 and HP IIP compatibility, as well as Apple's FinePrint technology, which smoothes jagged font edges (much like HP's Resolution Enhancement Technology). The higher-end LaserWriter IIG is

further enhanced with Photograde technology that produces a wider range of gray scales.

The LaserWriter IIf has a 20-MHz 68030 processor with 2MB of RAM; the IIG has a 25-MHz 68030 and 5MB of RAM—two of the fastest controller boards in any consumer laser printer.

To offer an upgrade path from the earlier LaserWriter IIf, NT, and NTX models, Apple has wrapped the controllers in the same slow 8-page-per-minute Canon LBP-SX engine. So, despite the fast "guts," the printer is hardly at the front of the pack. In IIP mode, theoretically the faster of the two emulations, the LaserWriter IIG

managed only .4 graphics pages per minute using PC Labs standard graphics speed test. That's less than half the speed of the \$999, 6-ppm Epson Action-Laser II reviewed on page 54 of this issue. Text fares better at 7.3 ppm. But it's still slower than the current crop of affordable 9- and 10-ppm printers that also offer PCL 4 and PostScript.

Apple continues its tradition of not offering parallel ports. Both the IIf and IIG have serial ports, but Apple dissuades even Macintosh owners from using them. A LocalTalk port is another feature, but it's not one that many PC users will use. Even the printers' SCSI port, which accepts up to seven SCSI hard disks, has special Apple-issue drives that must be initialized through a Macintosh.

The LaserWriter IIG also has

an Ethernet interface, which may be the only viable connection point if you don't own an Apple computer. It might also be the fastest way of accessing the newest feature of all: Both printers are the first to accept downloaded TrueType fonts.

After seven years of providing the PostScript standard to the IBM PC market, Apple has changed its course. To get the same compatibility (less the TrueType support) in a name-brand laser, you'll need the pricier IBM LaserPrinter 10 from IBM Lexmark. Its lack of an AppleTalk port means Apple owners need not apply.

■
List Price: Apple LaserWriter IIf, \$3,599; IIG, \$4,599. Apple Computer Inc., 20525 Mariani Ave., Cupertino, CA 95014; 800-776-2333, 408-996-1010.

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LANTastic for Windows: GUI Add-In Offers DDE on the LAN; Eases Setup and Resource Sharing

HANDS ON
by Steve Rigney

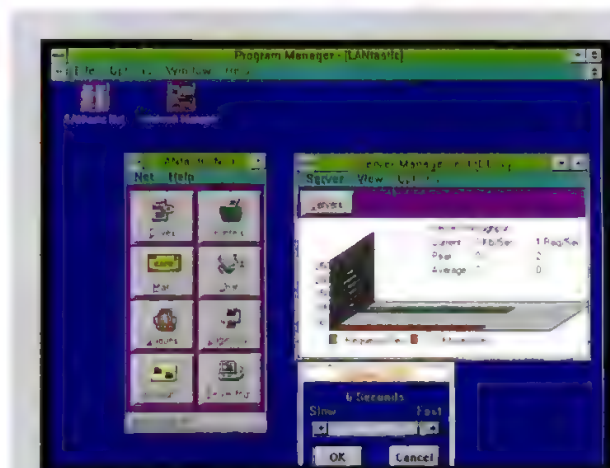
A simple-to-use fully powered network is more often than not a contradiction in terms. But in the case of *LANTastic for Windows*, a graphical user interface for *LANTastic* users, the terminology fits.

Artisoft takes *LANTastic*—its popular \$99 peer-to-peer network known for its ease of use and fast performance—and with a special front-end, tightly integrates it with the Windows environment.

The program does not provide full networking services in itself, you still need to run *LANTastic*, Version 4.0, Microsoft Windows 3.0, and DOS 3.1 or later. But affordably priced at \$299 per network, a single *LANTastic for Windows* package can service all your networked computers.

While it certainly makes the *LANTastic* environment a more handsome one, the package brings a good deal more to the party than just a pretty front end for a network operating system. By extending the power of Microsoft's application-to-application protocol—DDE (dynamic data exchange)—across the network, *LANTastic for Windows* can be thought of almost as an extension of Windows, as opposed to just an add-in for *LANTastic*.

LANTastic for Windows includes Windows versions of Net and Net_Mgr, the two main programs used to completely set up and operate the *LANTastic* network operating system under DOS. But it's through the use of macros, which allow DDE-supporting programs such as *Microsoft Excel* and *Word for Windows* to exchange messages and data through their DDE interfaces, that *LANTastic* shows its real power. *LANTastic for Windows*' electronic mail pro-



LANTastic goes GUI. Shown here is *LANTastic for Windows*' Net program menu with a graphical representation of server activity. Through DDE links in your Windows applications you can create a mail-enabled environment.

gram is "DDE-smart" and provides a way for applications to send data in real time across the network.

For example, you can create a spreadsheet in *Excel*, a document or message in *Word*, or a graphic in *PC Paintbrush* and send it to people on the network through the DDE interface to *LANTastic*'s electronic mail software. When they read your message, the corresponding application is launched.

To use the DDE command string interface, your Windows application must establish a link with *LANTastic for Windows*. The easiest way to do this is to issue DDE commands from within a macro in the native application. Most Windows applications, such as *Word*, *Excel*, and *CorelDRAW*, let you create these macros. The e-mail software moves the data to addresses described in the information passed by DDE. When the person receiving the electronic mail message clicks on an item in the mail queue, the message addresses DDE and launches the application in which it was originally created.

LANTastic for Windows also improves on the existing system for controlling network resources. People who use *LANTastic* under DOS depend on batch files to control the assignment of network resources to local DOS drive letters. This system works well, but it lacks flexibility because someone must edit the batch file each time a change is required. *LANTastic for Windows* makes the system more flexible by remembering your PC's network configuration, storing this information in a file called WNET.INI, and giving you the option of using that configuration or choosing another each time you start Windows.

Working in the Windows environment makes logging onto a *LANTastic* file server as easy as dragging an icon depicting your machine and dropping it to another icon depicting the server. And it's just as easy to connect to any other shared resources—including CD-ROM drives, printers, and plotters. Users also avoid the hassle of exiting Windows or moving to the Windows DOS prompt to



FACT FILE

LANTastic for Windows

Artisoft Inc., 691 E. River Rd., Tucson, AZ 85704; 602-293-6363.

List Price: \$299 per network.

Requires: *LANTastic* NOS 4.x, Microsoft Windows 3.x DOS 3.1 or later.

In Short: *LANTastic for Windows* combines the ease of use of *LANTastic* for DOS with the benefits of Microsoft Windows' graphical interface. It extends dynamic data exchange across the network and provides an easy, graphical way to configure and monitor the network. It also lets users control the network without leaving the comfort of Windows.

CIRCLE 449 ON READER SERVICE CARD

control these network tasks.

Artisoft offers a highly visual way to customize your PC's network configuration. You can choose from a variety of icons when you set up your list of shared resources. For example, you can select from several icons depicting objects ranging from 3.5-inch drives to CD-ROM drives. The package also includes icons representing both dot matrix and laser printers.

The Windows environment also simplifies life for network managers. The program can create a template of user accounts so the network manager can easily customize each network management menu. The user or network manager has the option of examining server activity and throughput in either a textual or a graphical-chart format. Another convenient feature is the on-line help that comes up when you press the F1 key; a standard feature of any Windows package.

While some programs simply run in the Windows environment, *LANTastic for Windows* adds value in its Windows migration. It fully exploits Windows' special features. DDE links make it possible to send smarter files across the LAN; the ability to do everything with a click of the mouse makes the network very easy to set up and monitor and should wake up the LAN-weary to the benefits of *LANTastic for Windows*. ■

File Edit Worksheet

(C0) [W12]

A:E10

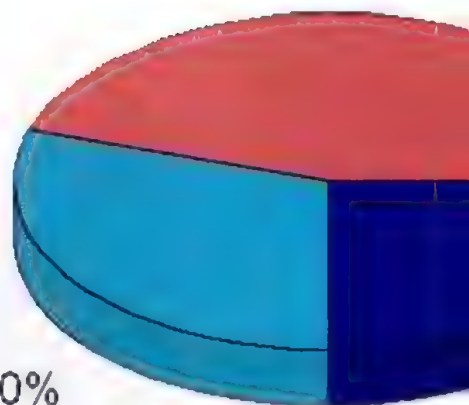
@SUM(B

	A	B
9		
10	Revenues	\$1,260,000
11	Costs	\$850,000
12	Profit	\$410,000



Market Share

45.0%



30.0%

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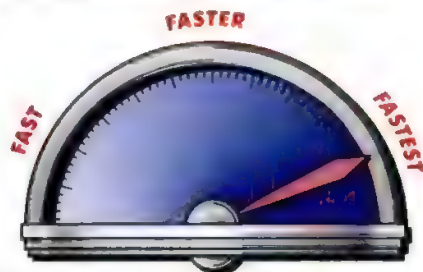
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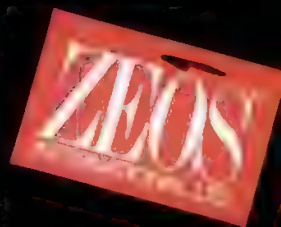
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First Looks

An Easy Route to Slick Animation

HANDS ON
by Rob Krenzel

Gold Disk's *Animation Works Interactive* puts interactive multimedia presentations within easy reach by taking full advantage of Windows Multimedia Extensions and giving users a set of animation tools that few competitors can match. The \$495 package is actually a vector-based animation program that has donned presentation accessories, such as fades, wipes, synchronized sound, and conditional branching. You construct presentations as a series of frames that the program plays back at high speed—a "movie" on your desktop.

Robust path-animation capabilities allow complex choreography of sprites. (Sprites are small objects that can be moved around individual frames or from frame to frame.) You define an animation path by dragging a sprite across the screen. The path then appears as a straight, curved, or freehand line with nodes that represent the sprite position at each successive frame. When you let your movie roll, the sprite cycles through its frames as it moves along the path.

To redefine a path, you can either drag nodes to new positions or cut and paste a sprite in

its entirety to a new location on the screen or to a different frame.

Animation Works Interactive lets you fill the screen with a flock of sprites moving with complete independence of direction, speed, and acceleration. In addition, you can define hierarchical relationships for effects such as a moon revolving around a moving planet. There are even options for creating realistic bouncing motion and for leaving ghost trails behind an object.

It comes with a library of multi-cel sprites: running dogs, revolving bullets, arrows that bring charts to life, and moving push buttons. A sprite editor lets you fashion new sprites cel by cel (a cel is a frame). Or you can import an image and transform it into a sprite.

There is no tweening as in Autodesk's *Animator*, nor are there any 3-D options, but the sprite editor can import Autodesk's *Animator* .FLI files.

You can create text blocks that move along a path or slide a word or line at a time on-screen. Unfortunately, though, the program offers no alternative to the barely adequate Windows screen fonts.

Animation Works Interactive lets you specify videotape playback rates well above the

desired 30 frames per second. However, even on the 33-MHz 386-based PC with 4MB of RAM we used for testing, the program sometimes had trouble maintaining a 20-frames-per-second playback rate.

To add nonanimated elements to a presentation, you simply attach them to individual frames. You can load backgrounds in .BMP, .GIF, .RLE, .DIB, or .PCX format and use the simple paint editor to modify them. Transition effects are more limited than in many other presentation programs.

The program can play MIDI or waveform audio files, or tracks from CDs. A presentation can also execute any MCI (Media Control Interface) command to access such Multimedia Windows functions as video overlay from a laserdisk player. (MCI is the Multimedia Windows "layer" for accessing multimedia devices.)

Animation Works Interactive takes a rather novel approach to conditional branching. You assign an interactive function to a sprite path, then click on the sprite (or type a letter) to execute the function.

You can branch to frames, audio files, or MCI commands, but this is limited compared with full-blown multimedia authoring systems. There are no variable handling or database functions that would allow computer-based training.

When it comes time to organize your presentations, *Animation Works* is much more difficult to use than presentation programs with a spreadsheet or



FACT FILE

Animation Works Interactive
Gold Disk Inc., P.O. Box 789,
Streetsville Mississauga,
Ontario, Canada L5M 2C2;
416-602-4000.
List Price: \$495.
Requires: 2MB RAM (4MB
recommended); Windows 3.0
(Multimedia Extensions
recommended); DOS 3.2 or
later.
In Short: *Animation Works
Interactive* excels at complex
object-oriented animation and
offers a healthy dose of
presentation features.

CIRCLE 706 ON READER SERVICE CARD

flowchart interface. The program's one serious failing is its lack of an easy way to cut and paste a group of frames or to move nonanimated elements from one frame to another.

Some of the difficulty is offset by a Cue Sheet window, which shows you where backgrounds change, where sound files are loaded, and so on. Clicking on an event takes you to the frame to which it's attached. A Storyboard Window displays thumbnails of structurally important frames.

The program comes with a runtime version that compiles your script and graphics files into a single file for easier distribution. The Gold Disk license permits you to distribute up to 100 runtime copies of a presentation free of charge.

Animation Works may well become a standard for vector-based animation. ■



Animation Works Interactive makes path animation simple. In this sequence, a dog runs across the screen in a straight path. The bird follows a curved path. Text slides onto the screen one word at a time.

First Looks

hDC Power Launcher: Windows Automation For Homesick Power Users

HANDS ON
by Barry Simon

When they switch to Windows, DOS power users often miss the freedom of the command line. Mousing around menus can be "a real drag" compared with the capabilities you get from a DOS command line, particularly from a command line enhanced with software such as Coft Software's *PCED*, JP Software's *4DOS*, or Moderne Software's *Anakey*.

Until now the best Windows equivalent of these DOS programs has been Abacist Software Co.'s \$39 *Hotwin* (see First Looks, May 28, 1991); it is still an excellent option. But hDC's \$100 *Power Launcher* provides an incredible degree of control over launching and managing applications, documents, microapps, macros, and scripts in the Microsoft Windows environment.

It offers six different ways to enter enhanced commands: a run box, keyboard macros, mouse macros, a toolbox, me-

nus, and a scheduler. In each of these, you can issue commands that launch/switch to applications, run a variety of supplied scripts, and send keystrokes or commands to applications.

When launching or switching to an application, you can specify the position and size of the window, the initial directory, the caption for the application window, and the label for its minimized icon. You can also prompt for a filename or a text string. Using the caption and icon control, you can control how DOS applications appear on the Windows desktop.

The location of applications is not limited to a single Windows screen. *Power Launcher* includes the "big desktop" capability introduced in *Wide-Angle* and found also in *Big-Desk*, *Hotwin*, and the forthcoming *Wintools*.

The big desktop gives you a virtual screen that can hold up to 8 by 8 real screens in size. You can launch applications anywhere on this grid, and move to a specific view using hotkeys or

a special "virtual desktop map" application. Notably absent from the virtual map are the names of the programs; they appear on-screen as unlabeled windows.

To assign menu choices to hotkeys or insert boilerplate into a program, you can send information via enhanced commands. The keystrokes sent to an application can include the date, time, last file specified, or last text parameter. You can also send menu choices or even DDE (dynamic data exchange) commands.

There are more than 60 scripts shipped with the product to allow additional control. Examples include commands to tile all open windows, to exit and restart windows, to shift your printer to landscape mode, to sound various musical tunes (for alarms), and to hide a given program. Hidden programs can still be accessed, since an enhanced task list lists hidden applications.

The keyboard and mouse remapping capabilities allow you to assign enhanced commands to keystrokes and mouse actions, respectively. For example, I've defined double-right-mouse-click to mean "Enter" and Ctrl-Alt-G to call up the program's visual desktop grid.

The *Power Launcher* commands attach themselves to the system menu. You can find the enhanced task list and a user-defined menu of enhanced commands on *Power Launcher*'s enlarged menu.

The program's scheduler can sound tunes or run an enhanced command at a given time or after a specified period of inactivity. So, for example, you could arrange to load a screen blanker after a predetermined period, thus avoiding the memory drain of it being resident all the time.

Visually, the program's most spectacular feature is the Power Toolbox. There are tools to set up arrays of iconized buttons that issue enhanced commands. The toolbox floats over any active application. This toolbox, as well as the keyboard and mouse macros, can be global or application-specific. For example, assigning a simple



FACT FILE

hDC Power Launcher, Version 1.0

hDC Computer Corp., 6742
185th Ave. NE, Redmond, WA
98052; 800-321-4606, 206-
885-5550.

List Price: \$99.95.

Requires: Windows 3.0.

In Short: Power users get tools to mold the Windows environment. Included in this collection are a menu maker, keyboard and mouse macros, a toolbox maker, scheduler, enhanced run box, and task list.

CIRCLE 450 ON READER SERVICE CARD

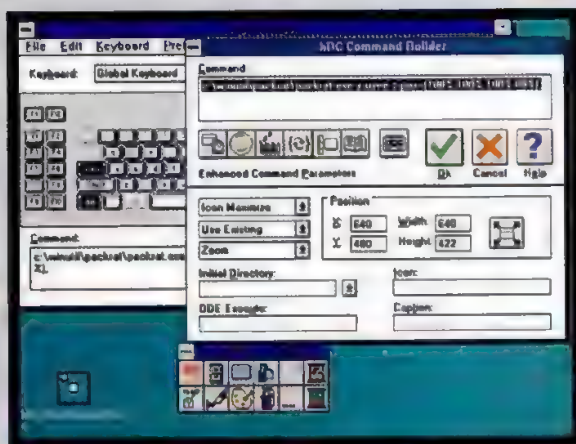
command like "<MENU=Edit-Header/Footer...><Enter>" to a button in a *WinWord*-specific toolbox gives you push-button access to a header panel.

While the syntax for creating an enhanced command line isn't too unwieldy, things are made even simpler by the inclusion of certain tools. For instance, you can record keystrokes and menu commands, or you can specify location and size by dragging and resizing a supplied box. Scripts, files, and enhanced commands can all be accessed via supplied push buttons and dialogs.

Power Launcher has a few glitches, as you'd expect in the first version of such a rich product. There is an incompatibility with *Intermission* (a screen blanker) that can be avoided if you don't call up enhanced commands directly from an *Intermission*-blanked screen. I also couldn't get the landscape/portrait scripts to work properly.

I quickly developed a long wish list. The most glaring omission is the lack of a "file find" in the file launch box. The command line should also support aliases and have the full array of capability that *PCED* has in the DOS environment. Finally, the history list doesn't properly handle reused commands.

But these are minor defects. After only a few weeks, I've found this program so essential to the way I run Windows that it's hard to imagine running Windows without it. ■



At the core of *Power Launcher* is the enhanced command line dialog, a graphical command builder for managing and launching applications and files. Also shown here are the product's desktop map icon and its toolbox.

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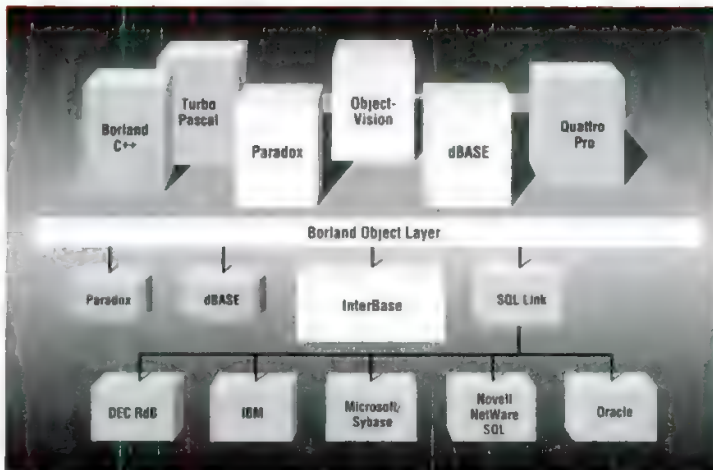
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*1991 J.D. Power and Associates' Computer End User Satisfaction Study. Phase I: Office-Based Small to Medium-sized Businesses. **Response from Business End Users at 1,784 business sites. Small to medium-sized businesses were based on office sites with between 1 and 499 employees. 1991 J.D. Power and Associates' Computer End User Satisfaction Study. Phase II: Office-Based Large Businesses. **Responses from Business End Users at 1,094 business sites. Large businesses were based on office sites with 500 or more employees. J.D. Power and Associates is a service mark of J.D. Power and Associates. †Dealer prices may vary. Upgrade pricing good in U.S. and Canada only. Borland is a registered trademark of Borland International, Inc. Copyright © 1991 Borland International, Inc. All rights reserved. BI 1433-2C

CIRCLE 295 ON READER SERVICE CARD

First Looks

Top Notch, Top Dollar, Authorware Is a Serious Multimedia Tool

HANDS ON
by Paul Murphy

At \$8,000, *Authorware Professional for Windows* from Authorware Inc. is by no means the multimedia authoring software for the masses. But despite the "for-experts-only" price tag, it is very easy to use, even for nonprofessional media creators.

Authorware successfully provides the tools and the friendly environment you need to develop effective training and educational applications. It combines various multimedia elements, including CD-ROM, videodisk, MIDI, animation, graphics, and user interactivity.

The logical structure of an *Authorware* application is created graphically by placing one of 11 design icons on a "flowline"; there's no scripting language to learn. For instance, simply by dragging and dropping a Display icon, you can place a title page created with *Authorware*'s adequate set of vector-based drawing tools. The program also imports graphics in a wide variety of formats and can use graphics transferred via Windows' Clipboard.

Text can be added to a screen using any Windows-capable scalable fonts and edited using word processor-like tools. Then, to supply a sound track or vocal instructions, drop a Sound

icon into the diagram and designate a MIDI music file, a .PCM (pulse code modulation) file, or a .WAV file. (.WAV is the standard digital waveform sound file format for Multimedia Windows).

Interactivity is just as easily added. Suppose you need to request information, such as a name, from a user. Just drop a Display icon onto the screen that contains the question and a blank for the response. Then you might check the user's name against a look-up table that tracks log-on times and response scores, or simply store it for use later as a variable.

Authorware also handles conditional responses with great aplomb by building in branching capabilities. You can supply a range of correct responses, detect spelling errors, and even tag anticipated incorrect responses with messages. The questions can be linked to graphics, video, or sound files that the user will view as a response to an answer. For instance, you might ask the user to click on a picture of a hamburger. If the user then proceeds to click on the incorrect picture of a hot dog, the audio chides, "No, the hamburger, silly!"

Animation (both path animation and sprite animation) can be applied to any on-screen object. You can move an object

along a path by specifying screen coordinates or by simply dragging the object with the mouse. Other icons you can place on the flowline include Video icons that play video sequences and still frames, Wait icons that add pauses for user response, and Erase icons that erase objects with one of 13 special effects such as mosaic dissolves or venetian blinds.

A great deal of *Authorware*'s muscle comes from its ability to link to external programs. There's a library of dynamic data exchange (DDE) functions to send and receive data from other Windows applications. And dynamic link libraries (DLLs) provide easy access to external programs and utilities; thus, for example, the program can read and write data to and from ASCII files and utilize external graphics files (.BMP and .DIB) directly without importing them. This can be invaluable when the core of your application utilizes data from external sources such as stock quotes, spreadsheet charts, or sales figures.

Authorware comes with a collection of sound files (.WAV and MIDI), animation sequences (.MOV), and graphic images (.DIB), though you'll probably want an external source to give you a wider range of clip art. There are also recyclable preprogrammed "models"—sample applications and subroutines.

Perhaps the most intriguing aspect of *Authorware* is its ability to utilize diverse media concurrently. Animations can run while audio tracks play or video sequences run. And applications can be edited easily and re-



FACT FILE

Authorware Professional for Windows

Authorware Inc., 275 Shoreline Dr., #535, Redwood City, CA 94065; 800-756-9602, 415-595-3101.

List Price: \$8,000.

Requires: 2MB RAM, 40MB hard disk, 16-color VGA, Windows 3.x, mouse.

In Short: A multimedia authoring environment for creating full-blown interactive desktop presentations, *Authorware Professional for Windows* integrates text, graphics, animation, sound, video, and extensions to external programs.

CIRCLE 444 ON READER SERVICE CARD

started to reflect the changes.

Completed *Authorware* applications can be packaged with the included runtime module for delivery on any PC running Windows. (Distribution licenses are available at an additional cost.) You'll want the ability to transfer these files to large-capacity media. A simple application with just three graphics and two questions took 600K of disk space.

Authorware offers 50 percent discounts to developers and resellers who participate in its Creative Partners program, a sort of multimedia co-op. And accredited educational institutions can obtain individual and site licenses starting at \$995.

For professional multimedia developers, corporate trainers, educators, and anyone else who's truly serious about multimedia, *Authorware* lends true legitimacy to Windows as a multimedia platform. ■



Authorware uses a flowchart metaphor to create interactive presentations (left). You can incorporate graphics, video, and sound from external sources. Dialog boxes let you include branching responses and hot buttons. You can switch between authoring and viewing mode (right) to check the script development.



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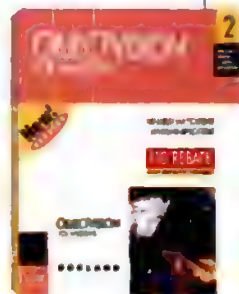
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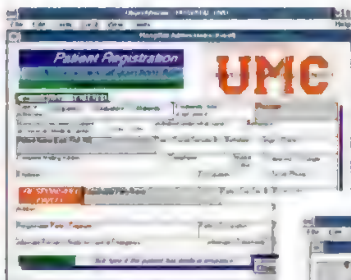
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CIRCLE 185 ON READER SERVICE CARD

First Looks

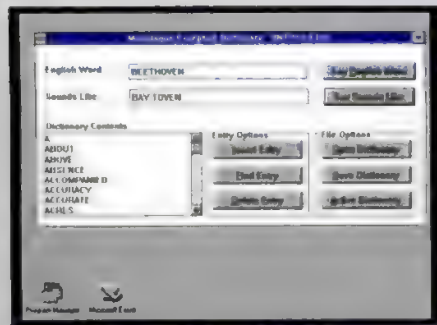
A "Sound" Investment in Text And Spreadsheets

HANDS ON
by Craig Stinson

Like its DOS-based predecessor, *Monologue for Windows* brings voice to text documents and spreadsheets. Based on the Smoothtalker text-to-speech technology, which First Byte licenses to everyone from toy makers to defense contractors, *Monologue for Windows* (\$149) uses the same speech synthesizer as the DOS version (see *PC Magazine*, March 26, 1991) and

your computer's built-in speaker to "read" text from Windows Clipboard or read the current selection in an *Excel* spreadsheet. A click on the *Monologue* icon starts your computer speaking. While unmistakably machine-generated, the output is intelligible and easy to customize.

The auditory assist *Monologue for Windows* provides is useful for proofreading documents and beneficial for the visually impaired.



Monologue for Windows can "speak" text placed in the Windows Clipboard or contained in an *Excel* spreadsheet. It can be trained in pronunciation.

The program takes a rules-based approach to speech synthesis rather than a lookup approach. It recognizes common English spelling constructions and even interprets certain punctuation. Question marks produce an upward inflection, and periods generate pauses—unless they fall between consonants (where they're pronounced "dot") or numbers (where they become "point").

With the dictionary builder you can override *Monologue's* rule book. For example, the program's default treatment of all-caps acronyms is to spell out the word letter by letter. Instead, you can make ANSI rhyme with Nancy simply by filling in a dialog box.

Within narrow limits, you can also tailor the volume, speed, and pitch of the mechanical voice. However, the voice is unalterably masculine and often inaudible, even at full volume. To boost sound, *Monologue* can take advantage of Sound Blaster boards, as well as sound devices such as the Covox Speech Thing and any board that supports the Multimedia Extensions for Windows.

If you have a modest grounding in Windows programming concepts, you can

also program it to read data poked into a DDE stream, or invoke the speech engine's DLL directly. First Byte's slim user manual provides DDE and DLL examples in the *Ami Professional* and *Excel* macro languages. Support for 1-2-3 for Windows is forthcoming.

For spreadsheet work, First Byte's *Monologue* has much of the intelligence it needs, but not quite all of it. It reads currency-formatted values as dollars and cents, and it knows the powers of ten better than most native English speakers. But it doesn't read numbers within parentheses as negatives, and it ignores trailing zeros. More disappointing is *Monologue's* inability to read formula text correctly. It recognizes only some *Excel* operators and skips over commas.

For the visually impaired or for anyone else needing audible help in proofreading plain Windows text and checking *Excel* input values, *Monologue* is a sound investment.

List Price: *Monologue for Windows*, \$149. **Requires:** Microsoft Windows 3.0 or later, mouse. First Byte, 19840 Pioneer Ave., Torrance, CA 90503; 800-523-2983, 310-793-0610.

CIRCLE 448 ON READER SERVICE CARD

Epson's ActionLaser II: Six Pages per Minute for \$999

HANDS ON
by Bill O'Brien

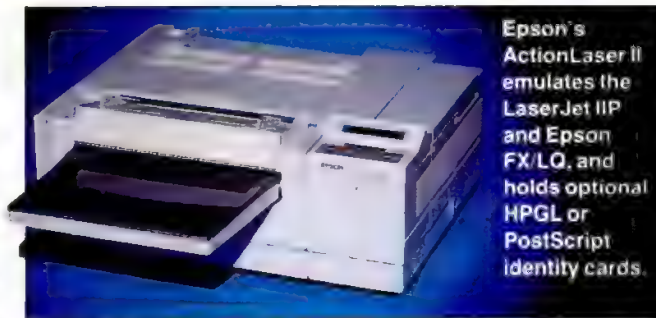
Epson America, well known for its low-priced dot matrix printers, has introduced the laser equivalent. The \$999 ActionLaser II, a 6-page-per-minute printer, is powered by a Ricoh engine and aimed at Hewlett-Packard's LaserJet IIP market. Epson plans to sell the ActionLaser II through computer superstores and resellers as well as through the retail consumer chain. Discount pricing might drive the cost of the printer down to the \$700 range.

The ActionLaser has great market potential. At 7 by 19 by 14 inches (HWD without paper trays), the 30-pound printer is

slightly smaller than the classic contact footprint dimensions of a desktop PC. Epson rates it for 3,000 sheets per month with a life expectancy of 5 years. Separate toner (5,000 sheets, \$125) and developer cartridges (30,000 sheets, \$175) give it a 3.6 cents-per-copy cost (plus the price of paper).

The ActionLaser II contains 14 resident fonts split into LaserJet IIP and Epson FX/LQ emulations. Additional HP-compatible font cartridges and optional Epson GL (HPGL-compatible) or PostScript identity cards can also be used.

Graphics is not the base model's strong point. Its 512K of memory allows for only a half page of graphics at 300 dots



Epson's ActionLaser II emulates the LaserJet IIP and Epson FX/LQ, and holds optional HPGL or PostScript identity cards.

PHOTOGRAPHY: THOM O'CONNOR

per inch or a full page at a reduced 150-dpi resolution. The printer memory is expandable to 5.5MB of RAM; at least 1MB of RAM is recommended for graphics printing.

The ActionLaser is not Epson's first laser printer. The Epson EPL-7000 and EPL-7500 (a PostScript version of the EPL-7000) are more expensive 6-ppm printers based on a Minolta engine (see "Desktop Lasers: Fast, Flexible, Affordable,"

November 26, 1991). The ActionLaser performed on a par with other Ricoh engine-based printers. While it doesn't set any new standards, Epson's major push into the mass market brings us one step closer to a laser on every desk.

List Price: ActionLaser II, \$999. Epson America Inc., 20770 Madrona Ave., Torrance, CA 90509-2842; 800-922-8911, 310-782-0770.

CIRCLE 449 ON READER SERVICE CARD

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CIRCLE 285 ON READER SERVICE CARD

First Looks

Notebook Computer and LCD Projection Panel in One

HANDS ON
by Henry Ford and Wells

NovaCorp International has an idea so elegant yet simple, it's a wonder no one did it before. It's a notebook computer that becomes an LCD projection system. All you do is remove the notebook's LCD screen, slide on the fan units, and place the unit on top of an overhead projector. When you clip the screen on again, you have a high-performance 386SX computer.

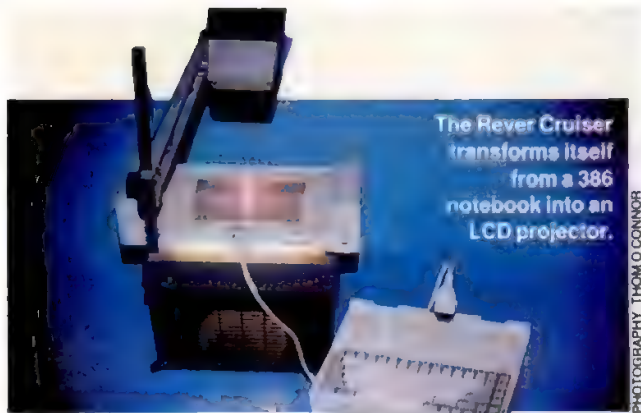
In its basic configuration, the Rever Cruiser (\$3,495) comes with a 386SX 16-MHz processor, 1MB of RAM, a 1.44MB floppy disk drive, a 40MB hard disk, two serial ports and one parallel port, a battery pack, a cooling fan for projection use, DOS 5.0, presentation utilities, and a carrying case. We reviewed a 386SX 20-MHz-based model with 4MB of RAM and a 60MB hard disk (\$4,295). These prices are

a bit high compared with other notebooks in this class.

The screen is a triple super-twist LCD by Citizen. It supports 16 gray-scale VGA and produces clear, sharp images. Even after the screen is left on top of a projector, there are no bright or dark spots or distortions. At the highest setting the screen seems less bright than some other notebooks, perhaps because the display uses only single-edge lighting.

Converting the screen from a notebook to an LCD panel is painless. Careful design is evident elsewhere in the Cruiser. There are push/pull screen controls, along with a button to blank and resume the screen. The floppy drive and the battery unit sit on the front, making them both very accessible.

It also has two serial ports, one parallel port, external keyboard and video connectors, an external floppy disk drive connector, and a 96-pin proprietary



16-bit AT-bus connector. The 84-key keyboard has separate position and cursor keys, 12 function keys, normal spacing between keys, and a nice feel.

You can increase the RAM up to 16MB and you can get an 80MB hard disk. NovaCorp also sells two different types of wireless mouse to control presentations remotely and an expansion box (\$69) that holds three full-length, 16-bit cards.

But the Cruiser is oversized for its class. It measures 2.6 by 12.9 by 10 inches (HWD) at 8.5 pounds. With all the components the unit weighs just under 14 pounds. Part of this can be attributed to the heavier-than-usual battery, just under 2 pounds.

The battery has a disappointing charge-life of only 1.5 hours. With power-saving fea-

tures that put the screen and hard disk to sleep you can increase the battery life, but with normal use, you can't get close to the 3 hours of rated life.

As a notebook the Rever Cruiser has some nice, though not exceptional, characteristics. As it transforms into an LCD panel, it becomes a solution for taking your show on the road. ■

List Price: Rever Cruiser 3S with 386SX 16-MHz processor, 1MB RAM, 40MB hard disk, 1.44MB floppy disk drive, VGA LCD screen, one parallel and two serial ports, cooling fan, DOS 5.0, utility software, soft carrying case, \$3,495. NovaCorp International Inc., 168 Bluegrass Ln., # 100, Rochester, NY 14626; 716-723-8820.

CIRCLE 417 ON READER SERVICE CARD

Clip and Save Turns Your Windows Clipboard Into a Screen Saver

HANDS ON
by James Karney

Clip and Save is a \$149 Windows screen capture utility that is really an extension of the Windows Clipboard.

Most screen-capture programs require that you either save an image as a file or copy it to the Clipboard before it can be loaded into another application. With *Clip and Save* you can capture any portion of the screen and copy it into any other Windows program. However, since the Clipboard can only store one image at a time, you cannot capture multiple images without saving them first.

Clip and Save sends the Clipboard contents to the Print

Manager, giving you the kind of PrintScreen function available in DOS. And it works with all kinds of displays: from monochrome to 24-bit true color.

Four menus give access to

all features and options, including converting to monochrome or gray scale prior to capture, defining hotkeys, and specifying delay intervals for capture.

Capture control is robust. You can capture the entire desktop, a specific window, a rectangle, or a freehand shape. Rectangles can be sized with on-screen dimensions and cross-hair guides. Positioning

aids, including a pointing finger and a grid provide precision.

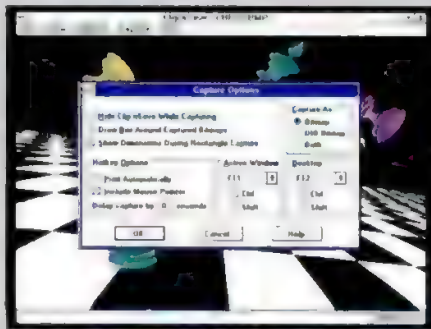
Clip and Save handles file conversions as well. It imports both Windows and OS/2 Bitmaps (.BMP), device independent bitmap (.DIB), .RLE, .GIF, .PCX, and TIFF files. Export and file conversion is supported for all except .DIB and .RLE. You can also save files as EPS files. A preview window lets you look at files before loading them.

Images can be saved as 24-bit true-color, 8-bit 256-color, 4-bit 16-color, and monochrome files, and all but the OS/2 .BMP files can be compressed when saved. ■

List Price: *Clip and Save*, 2.0, \$149.

Requires: Windows 3.0. Dynalink Technologies Inc., P.O. Box 593, Baconsfield, Quebec, Canada H9W 5V3; 514-489-3007.

CIRCLE 438 ON READER SERVICE CARD



Clip and Save's options for customizing screen captures include changing the display from color to monochrome, setting a delay timer, and placing a border around the captured image.

Now Shipping PC Tools Version

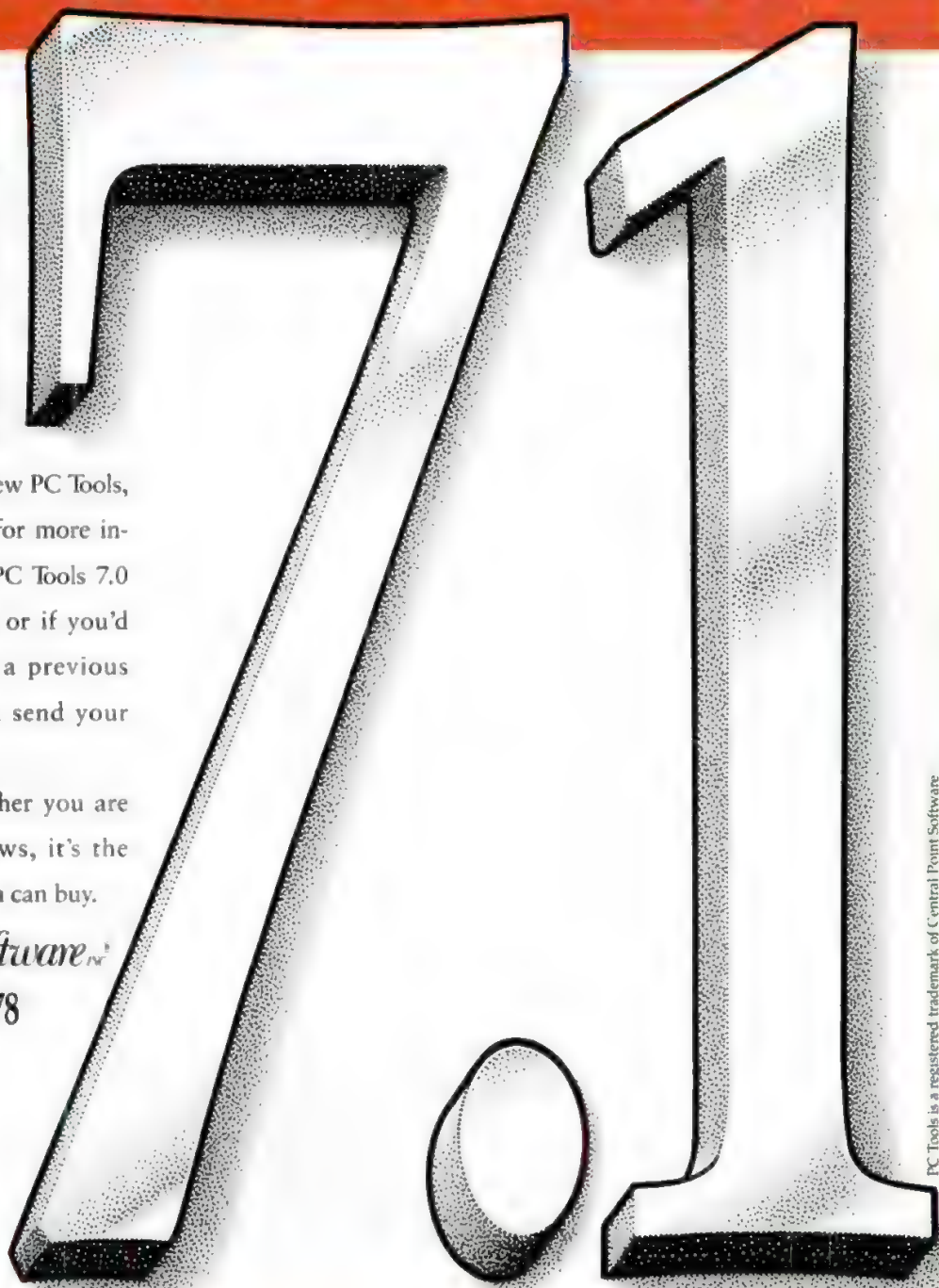
New PC Tools™ 7.1 is now in stock at dealers nationwide. And free updates are already on their way to hundreds of thousands of registered 7.0 users, including those who bought 7.0 as an upgrade.

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by
Emerson Andrew
Torgan

New & Improved

News of Announced Products and Upgrades

Sony Unveils 3.5-inch Rewritable Floptical Drives

NEW Sony has announced that four of its value-added resellers (VARs) are now offering its 3.5-inch rewritable optical/O-ROM (Optical Read Only Memory) drives and media. The drives comply with both ISO and ANSI standards. The VARs are offering the drives in several different configurations including half-height, internal and external, with externally switchable SCSI termination and SCSI ID dials, and lastly with drive utility software.

The devices use rewritable magneto-optical storage media that can hold up to 128MB of data on a single-sided "floptical" diskette. Several of the drives being offered by VARs will support a "free-form mode," increasing storage to up to 256MB. Sony claims average access time of 38 ms. and a disk rotation speed of 3,000 RPM, resulting in a throughput of 625K per second. According to Sony, the



Sony's single rewritable 128MB "floptical" diskette has the storage capacity of 89 1.44MB 3.5-inch floppy disks.

drives use split-optics to reduce the size and weight of the optical block, resulting in faster seek time.

Sony will not be selling these drives directly to consumers. They will be available only to the company's OEM customers and through VARs. See the optical storage section of Briefs (page 60) for a list of companies, prices, and configurations.

MastersPort 386SLe Offers More Power, Fast Parallel Port

IMPROVED Zenith Data Systems is shipping the MastersPort 386SLe. The 7-pound, 1.8- by 12.4- by 8.3-inch (HWD) notebook computer offers the power management capabilities of the Intel 386SL chip, running at 25MHz, and a new parallel port.

ZDS claims that the MastersPort 386SLe can wait in "standby" mode for several weeks, powering down the static-mount processor, screen, and other subsystems by approximately 75 percent while the machine is not in use. Working battery life is estimated at up to 8 hours by the company. "Rest" mode is intended to replace the need to turn the system off, allowing the user to resume working in an application weeks later. Standby mode conserves power until there is mouse movement or a keystroke. Work is automatically saved when the battery runs down by the "panic save" feature.

The MastersPort 386SLe also features a new high-speed enhanced parallel port (EPP) that features a Burst mode capable of delivering throughput of up to 2MB per second, improved from the 40 to 50K per second throughput of standard serial ports. ZDS' EPP promises to deliver notebook-to-LAN connectivity at speeds comparable to 8-bit ISA cards when using a parallel connector, such as Xircom's portable LAN adapters (see Trends, page 29).

The 386SLe's BIOS is stored in program-mable flash memory. This allows the user to download BIOS updates from ZDS' ZLink COM1 bulletin board on CompuServe.

The unit comes standard with 2MB of RAM, expandable up to 8MB (using proprietary memory modules), an 85MB hard drive, an internal NiCad battery (AC adapter/battery charger included), an internal 3.5-inch floppy disk drive, one serial port, an external VGA monitor port, and an internal modem port. Connectors are available for an external floppy disk drive and either a mouse, keypad, or external keyboard. The monochrome Super-twist LCD screen is cold-cathode backlit, and displays 640-by-480 resolution with 32 shades of gray.

List Price: MastersPort 386SLe, \$4,999.

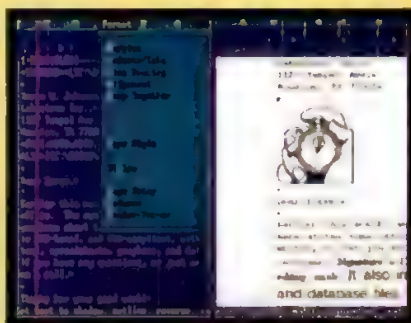
Zenith Data Systems., 2150 East Lake Cook Rd., Buffalo Grove, IL 60089; 800-553-0331.

NOT PROSPECT

XYQUEST RELEASES LONG-AWAITED UPGRADE TO DISPLAYWRITE AND XYWRITE

Xyquest has regained the marketing rights to *Signature*, its upgrade to *XyWrite III Plus* and IBM's *DisplayWrite* (see Trends, pg. 32). The DOS-based program, originally slated for release earlier this year, was codeveloped by Xyquest and the now dissolved IBM Desktop Software business unit. The new word processor combines the features and functions of *XyWrite* and *DisplayWrite*.

Signature adds new features to both word processors, including a WYSIWYG editing mode; a CUA-compliant menuing system; automatic conversion from dBASE, Lotus 1-2-3, Microsoft Excel, Microsoft Word, and WordPerfect file formats, in addition to accepting both *XyWrite III Plus* and *DisplayWrite* files; and support for foreign language and professional dictionaries. Also added are a host of low-end desktop publishing features that let you scale the package's BitStream Speedo fonts to size, wrap text around a graphic frame, crop and scale graphics, and manipulate columns, headers and ruled borders. *Signature* offers both *XyWrite III Plus* and *DisplayWrite* commands as well as mouse support. Beyond accepting *DisplayWrite* commands, however, the program most closely resembles *XyWrite*. **List Price:** *Signature*, \$495; upgrade from *Xywrite III Plus*, \$99; upgrade from *DisplayWrite*, \$119; competitive upgrade, \$129; **Requires:** 384K RAM, DOS 3.3 or later. Xyquest Inc., 4 Manning Rd., Billerica, MA 01821; 508-671-0888.



Signature, codeveloped by Xyquest and IBM, can display familiar *XyWrite* codes or a WYSIWYG view.

CIRCLE 431 ON READER SERVICE CARD

CIRCLE 432 ON READER SERVICE CARD

New & Improved

BRIEFS



MASS STORAGE

The following value-added resellers (VARs) are now offering Sony's 3.5-inch rewritable optical drives:

Pinnacle Micro will be offering both internal and external versions of its RE-130S drive (\$1,995). SCSI interface is included. The company will offer a stand that allows the drive to operate both horizontally and vertically. Media will be available from the company for \$79 per floptical disk. 800-553-7070, 714-727-3300.

Peripheral Land Inc. is releasing a half-height drive with externally switchable SCSI termination and SCSI ID dials. The Infinity Optical will retail for \$2,199. 3.5-inch rewritable media will be available for \$100 per disk. 415-657-2211.

Procom Technology is now offering the MEOD128, an external half-height drive. The rewritable optical drive requires a separate SCSI host adapter kit (\$89), and will retail for \$1,895. 800-800-8600.

MicroNet Technology is releasing the MO-128 External Rewritable Optical Subsystem with utility software and drive cable. 3.5-inch rewritable floptical disks will retail for \$69. 714-837-6033.



TAPE BACKUP

Mass Optical Storage

Technologies is releasing a drive similar to Sony's, but with a cached SCSI controller and a claimed access time of 36 milliseconds, compared to Sony's 38-ms. access. The RMD-5200-S (\$2,425) MOST drive will also use a 1.6-micron track pitch free-format mode to achieve 256MB of storage, as well as the 128MB storage gained by using ANSI/ISO modes. The controller uses a 64K read-ahead cache and has a programmable EEPROM to accommodate future, higher-capacity media. 714-898-9400.

Sumo Systems is shipping a 5.25-inch rewritable optical drive that claims a storage capacity of 600MB as a result of its larger media. The SS630 (\$4,295)

CONTINUES ON PAGE 64

Cartridge Adds HP III Scalable Fonts to LaserJet II

NEW

Output Technology has announced BetterYet III, a PCL-5 emulation cartridge for the HP LaserJet II line. BetterYet III provides the entire complement of scalable fonts that come standard with a LaserJet III, as well as HPGL—Hewlett-Packard's graphics language. The cartridge does not offer the Series III's resolution enhancement technology (RET), however, since this feature is a function of the LaserJet III's controller.

Output Technology has licensed the same Agfa font drawings that HP uses. The \$299 cartridge provides eight scalable fonts, including bold, italic, and bold italic drawings of CG Times and Univers. Also provided are seven bitmap fonts and one stick font.

List Price: BetterYet III, \$299. **Requires:**

HP Series II printer or 100-percent-compatible unit. Output Technology Corp., 2310 N. Fancher Rd., Spokane, WA, 99212; 800-468-8788, 509-536-0468.

CIRCLE 433 ON READER SERVICE CARD

GRiD and PowerTek Release Cellular Notebook Package

NEW

GRiD Systems and **PowerTek Industries** have released the GRiD Cellular Notebook System. The 11-pound package combines a GRiD 1750 notebook computer with the PowerTek CMI (Cellular Modem Interface) 990, offering data transmission and reception on the road.

Designed for mobile professionals, the Notebook System allows users to either take the 6-pound 1750 into the field and return to a car to link up the PowerTek CMI, or to carry the complete system, which includes a cellular handset for on-site phoning. The GRiD Cellular Notebook System comes standard with the PowerTek CMI 990, 1MB of RAM (expandable to 5MB), an internal 3.5-inch floppy disk drive, and a 60MB hard disk.

List Price: GRiD Cellular Notebook System, \$5,871. GRiD Stems Corp., 47211 Lakeview Blvd., Fremont CA, 94537-6599; 800-222-4743, 510-656-4700.

CIRCLE 434 ON READER SERVICE CARD

Glass Hard Disks Offer Lightweight, Rugged Storage

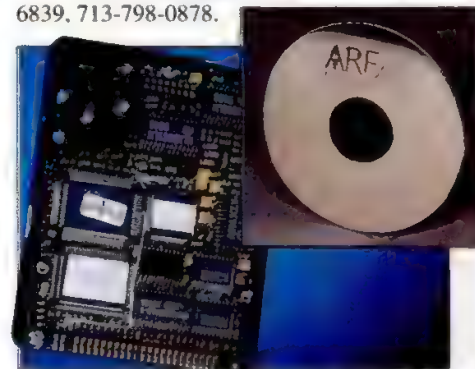
IMPROVED

Several laptop companies, including Zeos and Toshiba, are offering hard disk upgrades from **Areal Technology** that use a small, lightweight glass platter instead of the traditional aluminum substrate. Areal currently offers 60 and 80MB single-platter hard

disks in a 0.59- by 2.8- by 3.45-inch (HWD), 5-ounce form factor. The company will offer 120 and 180MB disks soon.

The chemically hardened glass platter is both harder and smoother than aluminum. The surface strength resists the small nicks that result from standard use. The smoother plate allows for higher area density, allowing the disks to be smaller, while increasing throughput and track density. According to Areal, the harder surface allows the disk to function at shock rates up to 20 G's, and to survive at nonoperation shock rates of 125 G's. Areal has found the tested life of its drives to be greater than 6 times that of aluminum drives.

Zeos is currently using the drives in its notebooks, and offers upgrades performed at its factory. Toshiba laptops can be upgraded through Laptop Solutions Inc. 10700 Richmond Ave., #114, Houston, TX 77042; 800-683-6839, 713-798-0878.



Areal's lightweight hard disk drives use a chemically hardened glass platter that is more rugged than aluminum.

List Price: MD2060, \$400; MD2080, \$450.

Requires: Toshiba or Zeos laptop. Areal Technology Inc., 2075 Zanker Rd., San Jose, CA 95131; 408-436-6800.

CIRCLE 435 ON READER SERVICE CARD

Everex Integrates Plain Paper Fax With Laser Printer

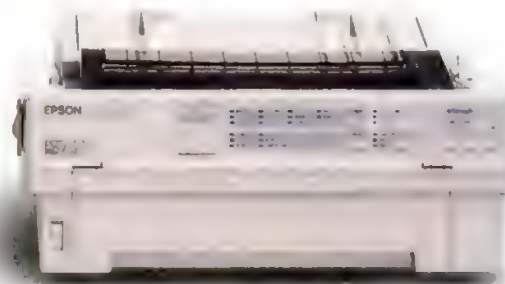
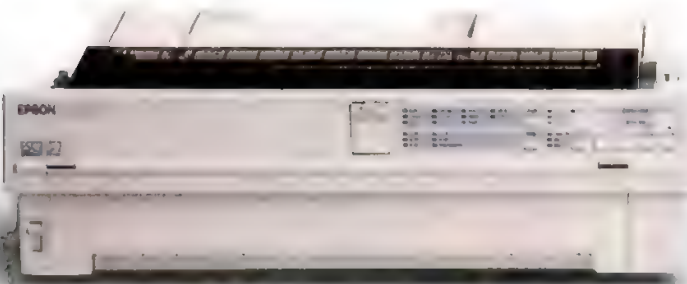
NEW

Everex has built a plain-paper fax machine into its LaserScript FAX Adobe PostScript laser printer. The LaserScript FAX is a 6-page-per-minute, 300-dot-per-inch printer that has auto-switching between PostScript and HP's PCL 4 printer control language. Based on a 25-MHz National Semiconductor processor and a floating-point accelerator, the LaserScript comes with 4MB of RAM and is expandable to 6MB. Its "fax" component is a Group III send/receive device.

The printer comes bundled with FaxManager software for Windows that uses a dBASE III- and IV-compatible phone-book database. The software supports screen form sending and automatic cover pages.

CONTINUES ON PAGE 64

Presenting
The Next Page
In Printer History.
From The Company
That Printed
The First.



Funny how history has a way of repeating itself. Year after year—actually for the past 25—Epson® has been the leader in dot matrix printing technology.

Introducing six reasons why that leadership is sure to continue: the letter-quality Epson LQ-570, LQ-870, LQ-1070, LQ-1170, ActionPrinter™ 5000 and ActionPrinter 5500.

More Paths To Success.

For sheer paper handling flexibility, no other printer—dot matrix, ink jet or laser—handles quite as well as these.

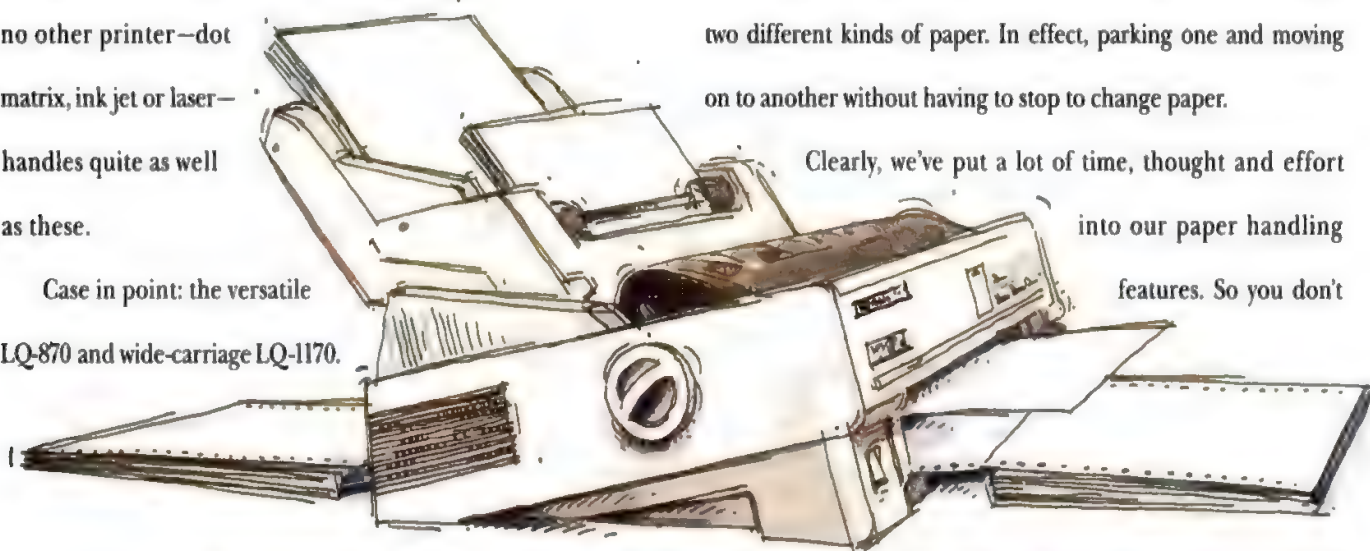
Case in point: the versatile LQ-870 and wide-carriage LQ-1170.

When fully loaded, these printers put as many as five types of paper at your fingertips. Everything from letterhead to continuous-form checks, four-part forms, tractor-feed paper, even envelopes.

All our printers can automatically handle 50 sheets using our optional single-sheet feeder. Add our high-capacity feeder and you're quickly up to 200.

Then there's Epson SmartPark™ paper handling. At the press of a button and flick of a lever, you can easily switch between two different kinds of paper. In effect, parking one and moving on to another without having to stop to change paper.

Clearly, we've put a lot of time, thought and effort into our paper handling features. So you don't



With five different paper paths to draw from at any moment, an Epson LQ printer is as versatile as it is dependable.

have to put much time, thought or effort into using them.

you'll get superior output quality and faster throughput speeds.

Scale New Heights.

Each new Epson printer comes with a new industry-setting standard—ESC/P2™. This breakthrough printer control system brings scalable fonts to dot matrix printing.

Simply put, type sizes are no longer as limited. So now you can do things with a 24-pin printer that before could only be done with a laser. And you don't have to give up one bit of paper handling flexibility to do it.

Graphically Superior.

What ESC/P2 does for type, it also does for graphics. Brilliantly.

It includes an enhanced Windows™ driver, exclusive to Epson.

When you print from any program running in Windows,

SCALABLE FONTS

With a new Epson LQ printer, you can print a variety of type in a variety of sizes, up to 32 point.

But don't just take our word for it. Take a look at the quality of our graphics instead.

Built For The Long Run.

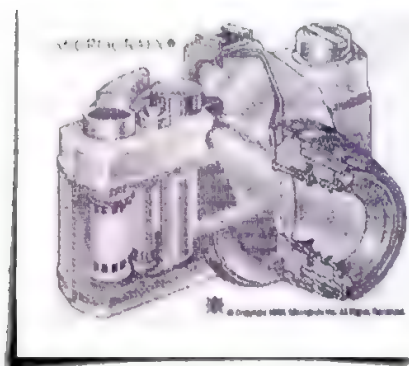
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EPSON



Desktops



Dot Matrix



Notebooks



Lasers



Servers

New & Improved

BRIEFS

CONTINUED FROM PAGE 60

measures 4- by 10.5- by 10-inches (HWD) and includes a SCSI-2 interface and software drivers. 408-453-5744.

Tallgrass Technologies is now shipping the FS4000, a DAT (Digital Audio Tape) backup drive (\$4,995). The FS4000 has a single tape capacity of 2GB, and over 4GB when using *FileSECURE*, a compression package bundled with the system. 913-492-6002.

Everex is now shipping a 3.5-inch SCSI minicartridge tape backup. The Excel 560 backs up 560MB of uncompressed data, or over 1GB of compressed data, at a rate of 32MB per minute. The Excel 560 is available in internal (\$1,579) and external (\$1,729) models. 800-628-3837.



MONITORS

Mitsubishi is now shipping its line of Diamond Pro high-resolution color monitors in 20-, 26-, and 37-inch sizes. Diamond Pro 20 (\$3,500) can display up to 1,280-by-1,024 non-interlaced resolution and offers VGA-to-high-resolution mode switching for CAD and other applications using VGA pass-through graphics cards. 714-220-2500.

Radius has begun shipping the PrecisionColor/20 (\$3,299), a multi-resolution, multifrequency, 20-inch video display. A built-in microprocessor lets the display automatically synchronize to graphics frequencies and store image parameters. 408-434-1010.

Wyse Technology is now shipping four new monitors. The 17-inch AM/8179 (\$1,299) has 0.26-mm. dot pitch and supports resolutions from 640 by 480 to 1,280 by 1,924 (noninterlaced) with automatic video adjustment. Also new are the 14-inch AM/732N (\$499) Super VGA monitor, the 14-inch VGA AM/732LC (\$399), and the AM/432LC (\$149), a 14-inch VGA monochrome monitor. 408-473-1200.

Everex is now shipping a \$179, 14-inch monochrome SVGA monitor with a maximum resolution of 800 by 600 pixels. The Everex Monochrome SVGA Monitor offers high-refresh rates of VESA, VGA, MCGA, SVGA and 8514/A

CONTINUES ON PAGE 66

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List Price: Everex LaserScript FAX, \$3,295.

Requires: Open parallel port, open serial port, and modular phone jack. Everex Systems Inc., 48431 Milmont Dr., Fremont, CA 94538; 800-628-3837, 415-498-1111.

CIRCLE 436 ON READER SERVICE CARD

1stAct!: Entry-Level Contact Management

IMPROVED Contact Software International is now shipping *1stAct!*, a scaled-down version of *Act!*, its contact management software. *1stAct!* combines a contact database, calendar manager, a predefined report generator, and a word processor. Unlimited notes can be attached to each contact record. Other functions include customizable contact screens, keyword searches, label and index card printing, and an auto-dialer.



1stAct!, a low-end version of the popular contact manager *Act!*, puts people at your fingertips.

Unlike *Act!*, *1stAct!* can access only a single database and is limited to five report formats. These formats cannot be customized by the user. The included reports are: activities completed, directory, phone, task list, and note report.

Contact Software International is also shipping *Act!*, Version 2.1, priced at \$395.

List Price: *1stAct!*, \$79.95. **Requires:** 640K RAM, DOS 3.1 or later. Contact Software International Inc., 1625 W. Crosby Rd., #132, Carrollton, TX 75006; 800-365-0606; 214-418-1866.

CIRCLE 437 ON READER SERVICE CARD

DataFlow Searches, Views, and Links Database Files

NEW IMS Soft is shipping *DataFlow*, a tool that lets users view, format, search, and sort different database file formats. The package supports *dBASE*, *Paradox*, and ASCII text files.

Users can convert between data formats

and view the data in both form or table modes. Columns can be moved, resized, or deleted from the display, and records can be sorted on preexisting indexes, or those created with *DataFlow*.

The Find command lets you jump to records matching a specific pattern, and Select marks all records that match that pattern. Select also allows incremental selections and can establish links between files of different formats.

In ASCII text files with delimited fields, *DataFlow* can create columns and then search, sort, and format data like any database file, according to IMS Soft.

List Price: *DataFlow*, \$89.95. **Requires:** 512K RAM, DOS 2.0 or later. IMS Soft, 15760 Ventura Blvd., #A-5, Encino, CA 91436; 800-477-0774, 818-784-6890.

CIRCLE 438 ON READER SERVICE CARD

Street Atlas USA Knows Where You Live

NEW DeLorme Mapping has started shipping *Street Atlas USA* on CD-ROM. *Street Atlas USA* contains over a million color maps that detail every street in every city, town, or rural area in the entire United States, according to the company.

To find a specific location, you can enter a phone number, zip code, or place name to view certain areas of the country. State, city, and street names can be entered in the Street Find pop-up box, and the desired street is highlighted on the screen. Users can view the entire country, and when zooming down to locations, can view any neighborhood or street corner.

Any map view can be printed out, or copied to any word processing or graphics program that accepts Windows bitmap images.



Street Atlas USA has over one million maps and can pinpoint any street corner in the United States.

List Price: *Street Atlas USA*, \$99. **Requires:** CD-ROM drive, Windows 3.0. DeLorme Mapping, Main St., P.O. 298, Freeport, ME 04032; 207-865-1234.

CIRCLE 439 ON READER SERVICE CARD

"Users have got to love the plug and play of the new DEC products; the fact that users can set up the systems in about 30 seconds is great and the products should sell well on that basis alone."

—Doug Gold, director of communications research at International Data Corporation, as quoted in *LAN TIMES*, April 15, 1991



uct. DEC has used its miniaturization and packaging engineering talents to, in effect, create the industry benchmark example for the right way to design a complex communication product acceptable for use in an exposed commercial workplace as well as a telephone closet . . ."

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—*Business Week/Industrial Designers Society of America Awards*, June 17, 1991

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—Frank Dzubeck, president, *Communications Network Architects, Inc.*, October, 1991

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BRIEFS

CONTINUED FROM PAGE 64
standards. It also operates in standard 640 by 480 mode. 800-628-3837



PRINTERS

Mannesmann Tally is now shipping the MT908 Laser Printer using a RISC processor. The MT908 (\$1,995) is HP LaserJet III-compatible with a claimed throughput 2.5 times faster than that of the LaserJet III. The MT908 comes standard with 1MB of memory (expandable to 5MB), and an optional PostScript-language-compatible interpreter is available as a plug-in daughterboard. 206-251-5520.

Texas Instruments is now shipping two printers utilizing the RISC processor. The microLaser Turbo (\$2,249) and the microLaser XL Turbo (\$3,649) offer 2.5MB of RAM (upgradable to 10.5MB) and an optional SCSI interface. Both feature Adobe's PostScript Level 2, and support the entire library of PostScript-compatible software programs. 800-527-3500.

Output Technology has unveiled the LaserMatrix 1000 Model 6 continuous form laser printer (\$5,495). With a built-in RISC processor, the printer offers PostScript emulation and HP LaserJet III (PCL-5) compatibility, and auto-switching between the two. 800-468-8788, 509-536-0468.

ASP Computer Products is shipping the JetWay printer sharing device in both four-port (\$345), and eight-port (\$545) versions. Both models come standard with a 256K buffer. 800-445-6190, 408-746-2965.

Action Laser Products is now offering The Paper Partner (\$69.95), an electro-mechanical sensing device that fits into the laser-printer paper tray. When the tray is empty, the device beeps until the tray is filled. 714-491-1983.

Budget Software's *Disk Spool II* is a \$44 program that captures data sent to a printer and saves it to a disk file, allowing users to resume working during large print jobs. Four spooling levels of the program ship on the disk, with the complete program requiring 64K RAM. 303-695-9095.

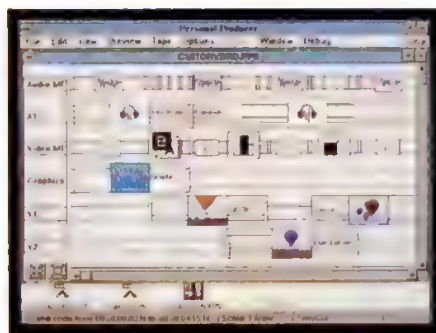
Personal Producer: Video Production On Desktop PCs

NEW Matrox Video Products is now shipping the *Matrox Personal Producer*, which lets users assemble and edit video, titles, audio, graphics, and digital video effects.

Recorded video material can be edited with the Video Clip Editor, and additional production elements are arranged in an editable Clip Collection. Elements are then arranged on a storyboard that contains media-specific timelines for the video source, a digital audio device, graphics from the hard disk, and video effects, transitions, and audio mixing effects.

A digital audio board is required to edit sound and narration or to compose music. Once the elements are in place they can be trimmed to required length, and the entire production can be previewed on screen before it is recorded to videotape.

Personal Producer requires the Matrox Illuminator-16/AT graphics adapter and ships with Microsoft Multimedia Extensions for Windows.



The storyboard of the Matrox Personal Producer contains timelines that are media-specific.

List Price: *Matrox Personal Producer*, \$695.
Requires: Matrox Illuminator-16/AT graphics adapter, Windows 3.0. Matrox Video Products Group, 1055 Boulevard St. Regis, Dorval, Quebec, Canada H9P 2T4; 514-685-2630.

CIRCLE 440 ON READER SERVICE CARD

GeoWorks Pro Adds Quattro Pro Student Edition

IMPROVED Borland has announced that *Quattro Pro Student Edition (SE)* will be integrated into *GeoWorks Pro*, an upgraded version of *GeoWorks' Ensemble* integrated application environment. The \$199.99 package includes a viewer, which lets you cut and paste or drag and drop any portion of a *Quattro Pro* spreadsheet into *GeoWrite* or *GeoDraw*, according to the company.

Quattro Pro SE's spreadsheet publishing

features include graphics, 3-D graph types, and an electronic slide show for presentations.
List Price: *GeoWorks Pro*, \$199.99.
Requires: 512K RAM, DOS 2.0 or later.
GeoWorks, 2150 Shattuck Ave., Berkeley CA 94704; 415-644-0883.

CIRCLE 441 ON READER SERVICE CARD

Adaptec Ships Two New SCSI Host Adapter Kits

NEW Adaptec is now shipping The MultiMedia Connection and The SCSI Backup, two SCSI host adapter kits for the PC. The MultiMedia Connection (\$179) is designed to connect CD-ROM and magneto-optical devices. It includes Adaptec's AHA-1510 AT-to-SCSI host adapter, as well as software drivers for both CD-ROM and magneto-optical drives that incorporate the Advanced SCSI Programming Interface (ASPI).

The SCSI Backup (\$259) allows connection of digital audio tape (DAT) and SCSI quarter-inch cartridge tape backup devices. The kit includes an AHA-1510, *Sytos Plus* backup software, and a cable.

List Price: The MultiMedia Connection, \$179; The SCSI Backup, \$259. Adaptec, 691 South Milpitas Blvd., Milpitas, CA 95035; 408-945-8600.

CIRCLE 442 ON READER SERVICE CARD

BeyondMail 1.1 Links To New Forms Designer

IMPROVED Version 1.1 of *Beyond Inc.'s BeyondMail* lets users access its new *The Beyond Forms Designer*, a Windows-based tool for creating custom forms for distribution and processing by e-mail. *BeyondMail 1.1* accesses the forms from the Compose menu.

BeyondMail's rule language has been enhanced to support importing and exporting comma-delimited files, and additional administrator utilities have been added to directory propagation and synchronization tools. *BeyondMail* contains addressing templates for off-LAN and inter-LAN communications compatible with all MHS e-mail systems.

Beyond has also announced that its e-mail product can now access the CompuServe Mail Hub for *NetWare MHS*, allowing users of *MHS*, Version 1.5.C to send and receive electronic messages via CompuServe.

List Price: *The Beyond Forms Designer*, \$395. **Requires:** *BeyondMail 1.1*; *BeyondMail 1.1*, free upgrade from *BeyondMail 1.0*; Server Edition with 10 node license, \$995; 5-Node Expansion Pack, \$495; 20-Node Expansion Pack, \$1,695; Remote-access version, \$295. **Requires:** 1MB RAM, DOS 3.1 or later, minimum 2.5 MB of hard disk space. Beyond Inc., 38 Sidney St., Cambridge MA 02139; 617-621-0095.

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Circle 259 on Reader Service Card

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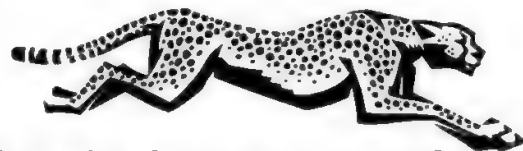
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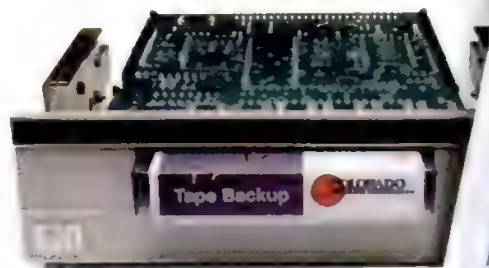


FIFTH GENERATION SYSTEMS, INC

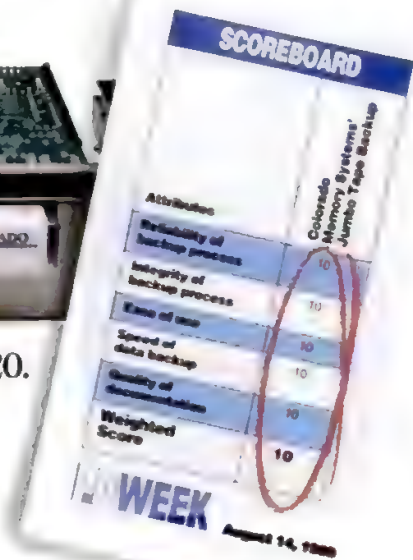
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edited by
Carol Levin

Read Only

Reviews of the Latest Books for the PC User

Visual Basic Tour Opens the Door to Windows Application Development

Programming used to be an activity for the trained elite, but since Microsoft introduced Visual Basic, writing Windows applications can be a pursuit for the masses. Two new books from two of the most respected computer book publishers will help you get up to speed fast with Visual Basic.

Visual Basic Programming with Windows Applications takes a hands-on approach to introducing Visual Basic to both active Windows users and those familiar with BASIC. Author Douglas A. Hergert introduces the fundamental concepts you'll need to know to work in Visual Basic and shows you how to create elementary forms—the building blocks of the Visual Basic environment. Next, you call up an application from the accompanying 360K disk, and Hergert guides you through its forms, controls, and procedures. In the process, the author provides a lucid and well-conducted explanation of Windows' event-driven programming model and how it forms the backbone of Visual Basic.

Hergert reduces the process of developing a Visual Basic program to three simple steps: creating forms and controls, establishing control properties, and writing the code to go with the controls. As you work your way through the examples, you build a loan calculator application that incorporates a variety of forms and controls. Strategically located review boxes give timely, concise information on how Visual Basic handles procedures and functions, what data types it supports, and other topics.



Visual Basic Programming also provides a thorough discussion of debugging—an often-overlooked element of programming—and explains debugging with Visual Basic tools.

Once the basics are covered, Hergert launches into developing a series of application programs. More than just examples of Visual Basic, many of them are useful programs: a

name, address, and phone database, a real estate database, a time-sheet program, and a pie-charting program that graphs data input to some of the other programs in the book. To illustrate the tenets of dynamic data exchange (DDE) under Visual Basic, Hergert develops a memo-printer application that takes memos created in an *Excel* spreadsheet and prints an individualized copy for each person on a list. To construct the list, you simply check off names in the memo-printer window.

With a firm grasp of the basics, followed by solid program-

ming examples, *Visual Basic Programming* does an exceptional job of introducing the controls, properties, menus and procedures that make up a Visual Basic form. Hergert's book is an effective tour through the steps of creating Windows applications under Visual Basic.

Visual Basic Programming with Windows Applications

by Douglas A. Hergert, \$44.95.
Bantam Computer Books, 666 Fifth Avenue, New York, NY 10103; 800-223-6834 (ext. 9479), 212-492-9479.
ISBN 0-553-35317-9.

CIRCLE 614 ON READER SERVICE CARD

Microsoft's Workshop in Visual Basic: No Toy for the Trifling

Where Hergert's book aims to acquaint you with the Visual Basic way of doing things, John Clark Craig's *The Microsoft Visual Basic Workshop* focuses instead on prepackaged programming tools and advanced programming techniques. Craig leaves no stone unturned in demonstrating that Visual Basic is as extensible as it is powerful and easy to use.

He opens with a history of BASIC and a comparison of a single program written for GW-BASIC, QuickBASIC, and Visual Basic. He also demonstrates the step-wise process of application development.

The focus then shifts from a tutorial in the mechanics of Visual Basic to the actual development of useful routines and programs. One strength is the accompanying 1.2MB disk filled with prepackaged forms you can adapt for your own applications. There are forms for displaying "About" boxes and help messages, for opening and saving the contents of files, for entering passwords, and for drawing status bars. An added touch: Each form is accompanied by tables

that list its menus, controls, and control properties.

Craig incorporates these forms into real-life applications: Calculator programs, graphics programs, and programs that explore the features of Visual Basic itself. Too often the book skimps on explanations of the code attached to controls, but the code listings themselves are living examples of Visual Basic commands and functions.

The section on advanced programming concepts explores the features that make Visual Basic a true Windows application development environment and not just a toy for the trifling. The author tackles DDE and shows you how to write applications that rely on DDE to pass data among Visual Basic programs and Windows applications.

You'll also learn how to call Windows API functions from Visual Basic. The disk even includes declarations for most functions and constants in Visual Basic syntax. One of the sam-

ple programs calls on USER.EXE functions to dial up the National Institute of Standards and Technology and set your PC's system clock. Finally, Craig shows you how to write DLLs (dynamic link libraries) in C with functions you can call from Visual Basic.

Craig is a skillful communicator who does an excellent job of explaining advanced programming in Visual Basic. Like Hergert's book, *The Microsoft Visual Basic Workshop* is loaded with screenshots, and

code is presented in an understandable format that makes it easy to correlate code and application. If these books are any indication, the future for Visual Basic and for Windows programming is bright indeed.

—Jeff Proisie



The Microsoft Visual Basic Workshop

by John Clark Craig, \$39.95.
Microsoft Press, One Microsoft Way, Redmond, WA 98052-6399;
800-677-7377, 206-882-8080.
ISBN 1-55615-386-4.

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MIDI Primer Explores Digital Music

Musical Instrument Digital Interface, commonly known as MIDI, is helping to revolutionize music. A relatively inexpensive MIDI setup can give even amateur musicians the resources that were once available only to large recording studios with teams of musicians. But negotiating the myriad hardware and software possibilities offered by MIDI is a daunting task. *The MIDI Manual*, by David M. Huber, makes the job more manageable.

MIDI is a digital communications protocol and hardware specification that enables electronic musical instruments to communicate with and control one another. It also allows complete performances to be stored,



edited, and played back by a microcomputer. *The MIDI Manual* provides a detailed and lucid discussion of the byte structure of MIDI messages, explaining exactly how they control musical parameters and how different controller messages are used in performances. The full MIDI specification as defined by the MIDI Manufacturers Association is even included.

Addressing the enormous range of MIDI-compatible hardware on the market, Huber devotes a chapter each to synthesizers, samplers, drum machines and controllers, and covers effects devices (such as equalizers), mixers, and hardware sequencers. Linking all these components

together in an optimum configuration is the next challenge Huber tackles in a thorough discussion of cabling arrangements and the use of switchers, mergers, and other I/O management tools.

Coverage of specific hardware products consists, too often, of laundry lists of features without adequate comparative commentary. And even knowledgeable users may be confused by the many specialized technical terms that are not defined.

The author does a good job of unraveling the confusing web of different timing standards for synchronizing electronic instruments. Huber explains the inner workings of MIDI sync, MIDI time code, the different varieties of SMPTE (a standard time code used by professional video producers), and some less common protocols. He also explores the relative merits of each system within a working environment.

Several chapters cover the role of the microcomputer in a MIDI system and examine the

range of MIDI software available for the PC, Macintosh, and Atari. There are sequencers, notation programs, sample editors, and patch librarians. Unfortunately, the information is a little out of date, and ignores newer developments such as sequence libraries and the role of MIDI in multimedia software.

The MIDI Manual's style is unrelentingly dry; convoluted writing and careless editing make some sections very rough going. Despite these limitations, the book's breadth, technical depth, and copious illustrations make it a valuable resource for anyone trying to gain a good understanding of the complex world of MIDI.—Robert Kendall ■

The MIDI Manual

by David M. Huber, \$24.95,
Sams, Macmillan Computer
Publishing, 11711 N. College Ave.,
Carmel, IN 46032, 800-428-5331,
317-573-2500.
ISBN: 0-672-22757-6.

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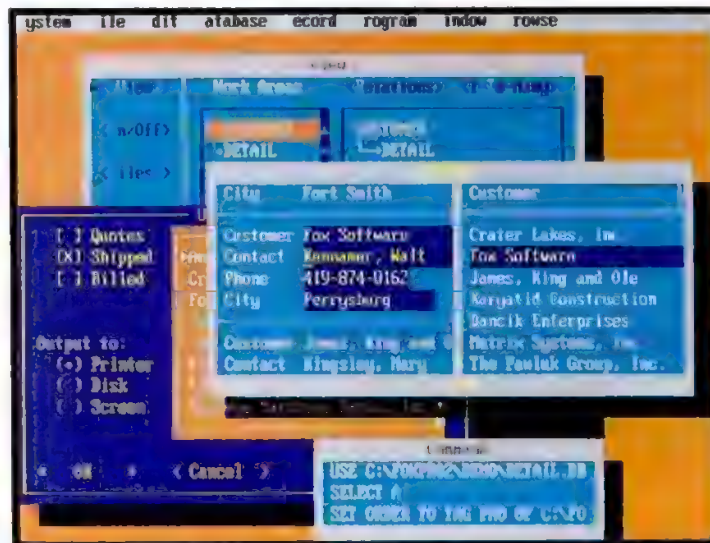
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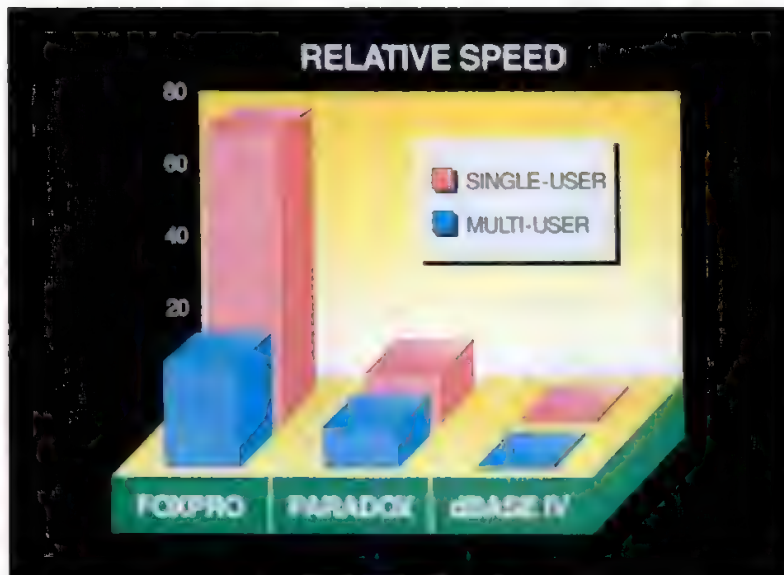
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THE NEW IBM LASERPRINTERS. PAGES AHEAD.

edited by
Trudy Neuhaus

Toolkits

Reviews of the Latest Tools for the PC Programmer

VIA and Alpha RPL: TSR Programming Without the Headaches

TSRs are among the most convenient programs you can use on a PC. But while many people use them, programming TSRs has been largely a task for a few dedicated gurus.

VIA, from Portable Computing Systems, and Alpha RPL, from Alpha Software, have changed all this. With a general knowledge of programming and one of these packages, you can write TSRs without the headaches associated with TSR programming.

VIA and RPL have many features in common. Each uses a translator program to convert its programs or scripts into an intermediate binary code, which is in turn interpreted by a runtime component that is itself a TSR. Each comes with an integrated editor/translator environment. And each includes numerous example scripts.

VIA and Alpha RPL are well-behaved TSRs that appear to be compatible with most applications except Microsoft Windows. Neither RPL or VIA should be loaded before starting Windows; only run them in a DOS session after Windows has loaded.

VIA

VIA takes a basic approach to its TSR language. It's complete, but lacks the frills of an HLL (high-level language) such as C or Pascal and is, therefore, more like an enhanced macro language. Statements such as *If/Else/EndIf* and *While/EndW* are accompanied by a set of screen- and keyboard-specific commands such as *Window*, for displaying a window on-screen, and *RdKey*, for reading a key from the keyboard. Variable names are limited to A



through Z and A0 through Z0, and special variable names are used for strings and arrays. Only one file can be opened at a time for each of the three file access modes: random, sequential read, and sequential write.

VIA's forte is keystroke simulation. Keystrokes are simulated at the BIOS level, which allows programs that bypass DOS and directly access the BIOS routines to still see VIA keystrokes. Unfortunately, programs that directly access the keyboard control port (I/O address 60h) will not see VIA keystrokes.

A handy feature is VIA's ability to capture data directly from the screen. The *Screen* command accepts row, column, and length parameters and returns a string that represents the characters on-screen at that location. While VIA does not support graphics modes, all standard text modes are supported. Nonstandard text modes are supported as long as the video BIOS properly reports the number of rows and columns.

VIA's ability to simulate keystrokes and capture the results on-screen makes it a convenient platform for software testing, but the limitations of the VIA language restrict its potential. As the complexity of a VIA program increases, so does the effort to program around its limitations.

The runtime component of VIA, required to run its scripts, takes 56K of conventional memory; it can take only 9K if expanded memory is available. Depending on its size, the script and its data can take up an additional 64K of conventional or, if available, expanded memory.

ALPHA RPL

Alpha RPL (Resident Programming Language) provides a powerful TSR scripting language that should meet the needs of all but the most intricate of TSRs. Where VIA provides basic TSR services, RPL provides a deluxe environment that includes such services as database access and mainframe HLLAPI communication. However, all this doesn't come without a price. RPL's required runtime component costs \$595 and can take a breathtaking 270K of conventional RAM. Fortunately, most of RPL's runtime component can be swapped to expanded or extended memory or to disk. Even with swapping enabled, though, the runtime component takes between 35K and 41K of conventional RAM.

RPL includes all necessary programming constructs: standard looping and branching complemented by functions that allocate and release memory, create windows, and display menus; a full set of file functions, such as *FOpen*, *FClose*, *FDelete*, and *FSetAttrib*; full mouse support; nine-character variable names and eight-character procedure names; an extensive set of functions including ones to read *dBASE III* files; and, as in VIA, a complete set of Windows management functions.

The programming environment is itself a TSR that you can access by a hotkey combination. Once inside the environment, via a set of drop-down menus, you can choose to run a precompiled script, edit a file, compile a script, or access any of a number of convenient utilities. If you're a novice, a code-generation function can help you generate the proper RPL syntax using a WYSIWYG

method. And the help system provides a complete on-line language reference.

The RPL package comes with a number of programs that make creating TSRs easy. A simple character-mode paint program can help you create screens that you can then capture and use in RPL scripts. A trace program helps you debug scripts. A library manager lets you bundle sets of functions written in RPL. And a function library bundled with the package contains functions to save and restore the current directory, get and set the VGA palette, and get DOS extended error information.

Both VIA and RPL allow novice programmers to create interesting TSRs. The high functionality of Alpha RPL will entice even experienced TSR programmers, but the memory overhead may turn off gurus who pride themselves on creating those tiny 2K TSRs. In addition, program distribution is complicated by the necessity of the runtime component. So, while they're

not solutions for every situation, VIA and Alpha RPL open up the world of TSR programming. —Douglas Boling



VIA, Version 2.0

List Price: Developers Edition, \$149; runtime, \$49. **Requires:** 56K RAM, DOS 2.1 or later. Portable Computing Systems, P.O. Box 870755, Dallas, TX 75287; 800-749-4917.

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Alpha RPL, Version 1.01

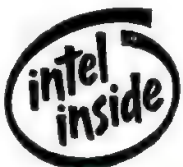
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Michael J. Miller



The Riddle of The Right Mouse Button

Will the right mouse button find its true calling or is it doomed to extinction?

As I spend more and more time using graphical environments, such as Microsoft Windows, I find myself wondering why every mouse sold for the PC has at least two buttons when few mainstream applications use more than one.

At least with the Macintosh and its one-button mouse everything is clear. With PCs, most people use a two-button mouse, usually from Microsoft Corp., Logitech, or one of the dozens of vendors who make Microsoft-compatible mice. Some people even use a three-button mouse. And while manufacturers such as Logitech have come up with an amazing number of variations—ranging from the head

mouse, to the left-handed mouse, to the mouse that actually looks like a rodent—we still return to using only the left mouse button. Microsoft, the com-

pany that redefined mouse design, even goes so far as to make the left button twice the size of the right.

We're still left with the riddle of the two-button mouse, however. And since two buttons make things more complicated than one (there's that much more to document, for one thing), the least that software vendors could do is come up with a use for that right mouse button.

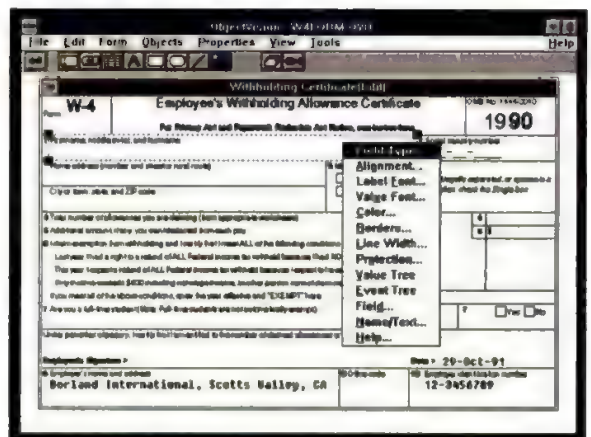
Certainly, there are some applications that could use a second or even a third mouse button. CAD programs and some high-end illustration packages are good examples. And most mice are sold with special macros and control panels that add functionality to our PCs. But we have seen limited support for the second mouse button from the applications vendors themselves. And when vendors have actually gone to the trouble of implementing the right mouse button into their software, the results have rarely been consistent.

A look at some Windows applications will demonstrate what I mean.

All of Lotus Development Corp.'s new Windows applications, including *Ami Pro*, *Lotus 1-2-3 for Windows*, and *Freelance Graphics for Windows*, feature "Smart Icons" that provide short cuts for performing various tasks. In all these packages, if you press the right mouse button on top of a Smart Icon, the program will tell you what the icon does. That's both consistent and useful.

Aldus Corp. uses the mouse in a completely different fashion. Clicking the right mouse button in either *PageMaker* or *Persuasion for Windows* will toggle between a 100 percent view, which shows your slides or documents as they will print, and a "fit in screen" view, which shows the whole slide or page. Similarly, holding down the Shift key and pressing the right button will toggle to a 200 percent, or zoomed view. This is certainly consistent between these two packages, but it is a markedly different approach from the way that Lotus uses the right mouse button.

Borland International may be late in delivering Windows applications, but it has strong ideas about using the mouse, particularly the right mouse button. In the forthcoming



One use for a right mouse button: In *ObjectVision 2.0* the right mouse button brings up a menu that lets you change various properties of an object.

ObjectVision 2.0, *Paradox for Windows*, and *Quattro Pro for Windows*, when you place your mouse on an item and click the right mouse button, you pop up a limited menu of commands. Only those commands that can affect what you have selected appear. In keep-

Michael J. Miller

ing with its object-oriented push, Borland has taken to calling the selected items "objects," and has even gone so far as to call the right-button actions "property inspectors." I prefer the more recent moniker of "menus on demand;" but whatever you call it, this approach will

make it easier to adjust things such as fonts or type alignment within a field.

KING OF THE INCONSISTENT

If the companies I've mentioned so far aren't consistent with each other, let's take a look at Microsoft. Microsoft makes the Windows environment, many popular Windows applications, and the largest percentage of the mice sold. And Microsoft's systems engineers will go on and on

about how important it is that applications be consistent so that people can get up to speed more quickly in new applications.

Unfortunately, Microsoft applications to date are incredibly inconsistent in the way they use the right mouse button.

Microsoft Excel 3.0 does not really use the right mouse button at all, but does not seem to suffer much as a result. *Microsoft Word for Windows* uses the right button mainly for a few very specialized tasks, such as selecting a rectangular block of text or choosing a column in a table. You can use the right button for some general functions in *Word for Windows*, but I doubt most people even know about them.

Did you know that once you've selected something in *Word for Windows* (usually with the left button), you can then move it to another location by holding the Control key and pressing the right mouse button? I didn't think so. You can also copy it, by pressing Shift, Control, and the right mouse button.

PowerPoint, on the other hand, uses the right mouse button for a fundamental task: moving selected text or graphics around on-screen. Microsoft considered this approach (using the right button alone) in *Word for Windows* to move and copy selected items, but abandoned it.

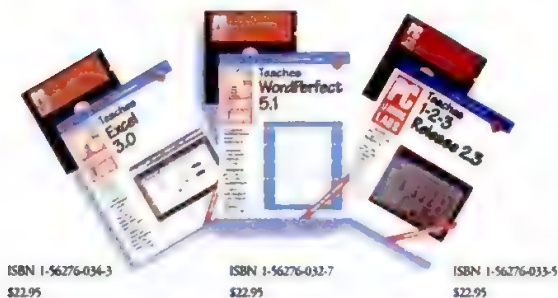
All of this is incredibly confusing. If we're going to have a standard user interface for things such as the F1 key to invoke on-line help, then we should have a standard use for the right mouse, too.

Microsoft finally seems ready to agree with this. It is trying to put together a Windows style guide that will define recommended uses for various things, including the right mouse button. Microsoft's current thinking is that the right mouse button should be used for pop-up menus or "instant menus" that define the various characteristics of selected objects. Sounds a lot like what Borland is doing.

There's nothing wrong in that, though. Pop-up menus probably offer more flexibility than just about anything else. A random set of additional features from each vendor won't solve the riddle of the right mouse button, but neither will a simple decree by Microsoft or any other group within the industry. Instead, the solution requires an application that implements the button so well that users will be convinced this is the right approach.

Personally, I like both the ideas of instant help and instant menus. Who knows, perhaps future applications can implement both. ■

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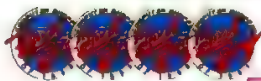
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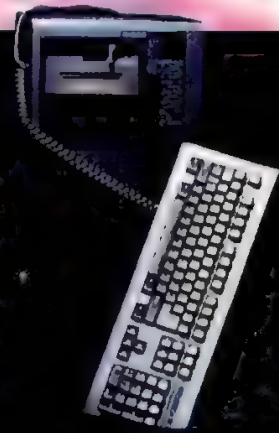
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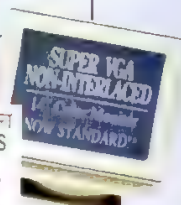
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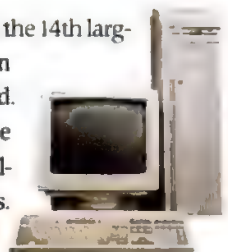
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Bill Machrone



Intel's Future: An Empty Socket

Intel has taken that embarrassing empty socket on 486SX machines and turned it into an incalculable advantage. Come take a tour of the motherboard and find out why.

In my last column (December 31, 1991), I chronicled Intel's revisionist approach to recent history—repositioning the 386SX, 386DX, and 486SX. Earlier last year, the lack of interest in 486 machines versus 386 machines was uppermost. A lot has changed in half a year—and in half a month.

In the last six months, 486 prices have dropped drastically. Manufacturers are reporting record sales of 486 machines. Ted Waitt, president of Gateway 2000, says that the 486/33 is his best-selling model. Granted that Gateway's prices are among the most aggressive, but people would save their money if

they really thought they were getting a better deal with a 386/33 or 386/40.

I have come to appreciate the 486 much more in recent months, as I've studied the technological advances that it embodies. Even Intel has revised its marketing of the 486 (no surprise there!), based on features that seemed unimportant at the time but are now very much in tune with the direction PCs are taking.

When Intel introduced the 486, it emphasized the 1x-clock memory system. In previous Intel microprocessors, the memory system runs twice as fast as the processor, necessitating either fast memory chips or complex, interleaved memory architectures that significantly raised the price of a system. Remember, 386-based PCs are commonly built with an external cache to keep overall speeds up while allowing designers to use slower, less expensive main memory. The cost of memory was a big issue then; many manufacturers charged hundreds of dollars per megabyte. Any design that could keep memory costs down was a good one, and that was how Intel positioned the 486.

IT REALLY IS BETTER

The 486's on-board 8K cache is well-chronicled, and it really works, but the most interesting by-product of the on-board cache and the 1x memory system is that the 486 uses the memory bus about 60 percent of the time, while the 386 uses it roughly 90 percent of the time. In a world gone graphical, that's a sig-

nificant difference. Also, PCs are undergoing some fundamental shifts in basic architecture. Watching the EISA-ISA-Micro Channel battles, I've been saying for years that the fastest bus is no bus at all. Putting functions on the motherboard, connected directly to the processor bus, is the way to make them go fastest.

Until you run out of bus cycles.

In the ideal computer, no process ever has to wait for another. Everything happens at full speed. The world inside the microcomputer, however, is no more ideal than the world outside. The processor never knows the state of the hard disk, or when it's going to be interrupted by a mouse movement or a character coming in through the serial port. Meanwhile, as users, we want video updates to happen as fast as possible. We also want to load data over the network at local disk speeds while simultaneously recalculating big spreadsheets in a graphical environment. Synchronizing this mess falls to the operating system software, with lots of help from the processor and the interrupt controller.

Designers would love to put the hard disk interface, 32-bit Ethernet, and Super VGA on the microprocessor's local bus to accommo-



ILLUSTRATION: KEN CONDON

date all these demands. But the combined number of clock cycles is too much for even a 486, and a 386 would be hopelessly swamped. The components on the local bus would only get a percentage of the potential performance available to them. Still, even with the inevitable waits, a PC with such a local-bus implementation would far outperform an equivalent machine that used the external I/O bus.

So, late in the game, I've become a 486 fan. And as the 486 looks more and more advanta-

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Bill Machrone

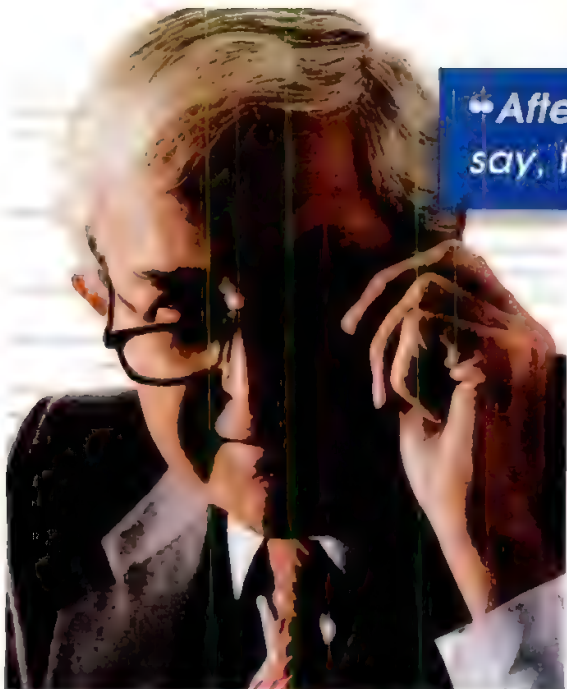
geous compared with the 386, more companies join AMD in producing 386-compatible processors (you'll recall that Intel's terminology is "386 imitator"). It'll be interesting to see if they can produce super-386 performance that lets these chips compete with the 486 in the important areas of local-bus speed and performance. If not, they'll be relegated to the lower end of the market.

EMPTY SOCKET FULL OF PROMISE

The challenge before Intel is whether it can allow clones to exist at the bottom end of the market while it pushes performance at the top of the market. The newly redefined role of the processor enhancement socket, or PES (it used to be the processor upgrade socket, but then the acronym was "PUS"), makes Intel's strategy clear—and is a daunting obstacle to any competitor. Intel has announced dual-speed processors that will fit in those sockets. Currently, 40-, 50-, and 60-MHz 486-compatible processors that work with existing motherboards are beyond the capability of any other company, and my informal tests show that the performance gain is real—and huge. The future for my 386/33 is suddenly bleak.

The other reason for the enhancement socket is to accept future families of Intel processors. We'll doubtless see two versions of the 586—or P-5, as it's currently called. One version will fit into the PES, while the other, a standalone version, will offer some performance advantage over the PES chip. And when standalone 586 machines are built, Intel wants system designers to put an empty socket alongside the 586 to accept even more powerful interim versions of the 586, and the 686 as well. Now that upgradable machines are the latest fashion trend, Intel's empty socket isn't the only way you can get the upgrade, but it's the only one that has a clearly articulated view of the future. The other chip manufacturers have enough challenges just keeping their processors Intel-compatible, much less advancing performance and making it plug into the PES.

Upgradable CPU cards will give the other 386 vendors a way to play; otherwise they'd be totally shut out of this game. But Intel will always have the inside track because of the PES. ■



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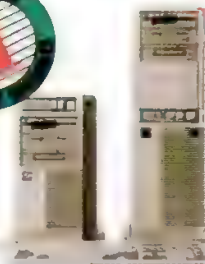
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John C. Dvorak



1992: The Year the Tail Wags the Dog

Personal computer manufacturers who think they can also design microprocessors are in for a rude awakening.

The predicted success of the Apple-IBM deal and the super SPARC chips deny an interesting trend in the industry—a trend solely responsible for the success and acceptance of the PC and Mac in the broad market. I call it the Chinese Menu Computer Design.

Desktop computing began when a few enterprising souls took some off-the-shelf parts made by semiconductor firms and built computers from them. General purpose, one-chip CPUs made this all possible. Within a few years (and long before the PC was introduced in 1981), a slew of semiconductor companies were making these general-purpose micro-

processors—Fairchild, Intel, Motorola, National Semiconductor, RCA, Texas Instruments, Zilog, and a host of others.

Kind of like a Chinese

menu, you'd choose the microprocessor from column A, the bus from column B, and the disk subsystems from column C. The most important thing to note was that computer makers did not design the chips. While mainframe- and minicomputer-makers stood fast with their philosophy of designing chips in-house, the newcomers ate into their business.

To understand the importance of this is to understand a basic trend of Western society: specialization. Chip makers specialized; they made chips that work. Because RISC technology simplifies design, companies such as Sun imagine that they can return to the old days of the computer company designing the chip, and the basic trend is clouded.

Sun, Apple, or any workstation-maker designing chips is counter to the specialist thrust of Western civilization. While specialization is often romantically resisted, it's not stopping for anyone. Even when a SPARC design from Sun is revamped by a dozen other firms, the chip will eventually fail in the marketplace.

So, too, with IBM's RS/6000, although giving the design to Motorola may have some potential. Still, the chip was designed by a

computer company, and now two computer companies (Apple and IBM) are redesigning it. These two should be concentrating their efforts on their jobs—building machines. Instead, they are doing chip design!

What's happening is a reflection of the unique dilemma of specialization. Many specialists, especially successful engineers, achieve a nirvana-like belief that understanding the principles of their specialty magically transforms them into all-knowing gods. You run into this phenomenon wherever there are engineers. It's at its ugliest when engineers are tapped for advice regarding advertising, publicity, marketing, or personnel.

Engineers usually don't know the first thing about sales, advertising, PR, or anything outside their field. In fact, many of their ideas outside of their specialty are just plain stupid. (Attention letter writers: I said the ideas were stupid, not the people, OK?) But if an engineer is the boss and the boss has stupid ideas, who is going to stop him? The only truth-teller is the CPA doing the books. The engineer can understand raw numbers and falling sales, the truth emerges, and pretty soon accountants are running the company—another blunder.



Engineers are the heart and soul of the computer industry, but they all suffer from this malady to some degree. In the process of piecing together a PC, they decide they can also design the chip for the computer.

So the tail wags the dog. Meanwhile, the companies that resist in-house chip design will be the companies that succeed. I'll tell you this, Intel won't be bowled over by part-time chip designers on a lark, that's for sure.

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Inside Track

Comdex has fully evolved into an international sales contact show. Note the word "international." I've never seen so many international reps before as I saw at Fall Comdex in Las Vegas. If someone told me that **one third of the showgoers** were from outside the country, I'd believe it. And the salesmen and buyers from all companies everywhere were doing an incredible business. More deals were lined up than ever before. This was a show for salesmen.

Even though the press was there in droves (Comdex officials ran out of press ribbons), there wasn't much in the way of news. Everything was preannounced, and details appeared in *PC Week* before the show began. Products actually introduced at Comdex could be better introduced at other shows and get better coverage. I believe that **this show can be skipped** now as a "must go" in much the same way the Consumer Electronics Shows need only be attended once every five years. There are no surprises in the business.

The big hullabaloo was over the **nifty color laptops** (I liked the Hitachi screens the best), but these were all there last year (and the year before) in different packages. Sharp rolled out its terrific **new 150-inch LCD video projector**. But it was no surprise, as they had been shipping an earlier model and the word was already out about this one.

Limos, Limos, Everywhere Dept.: An interesting new approach to transportation at Comdex was the infusion of, by one estimate, **50 percent more limos** than any year before. Anyone who had access to a limo had a much easier time going from place to place. The show spread out to every nook and cranny of Vegas. There was the Las Vegas Convention Center, the West Hall, the Sands Convention Center, Bally's Convention facility, the Mirage, and the Riviera. The parking was terrible, and there was **massive gridlock**. To get from point A to point B required the use of obscure shortcuts.

The first thing you saw when you got near the convention center was the **forsaken and empty Landmark Hotel** with a huge Apple banner running up and down its towerlike structure. Construction was all around the area, and the convention center itself is being further expanded. After the first day, the red carpet leading from the Hilton to the Main Hall was covered with construction material, requiring showgoers to march to the show on hard pavement.

The theme of this show was hype and showmanship. There were more magicians, comedians, and two-bit actors presenting **cornball scenes** than ever. The most amazing event, and unquestionably the **best event of the show**, was

staged by Computer Associates, which had a boxing ring and a slew of golden glove boxers actually fighting in front of a

huge crowd. There was a set of matches every few hours, presided over by **Joe Frazier** and a faux Don King while a bunch of **comely cheerleaders** did high kicks. Computer Associates must have spent over a million for this. It was hot!

After leaving the main show floor, you could head to Bally's, where the **popular multimedia products** were shown. **IBM was there with a second large pavilion** entitled

Ultimedia—a new trademark, it seems. In the Main Hall IBM had a pen-based computer, a couple of dazzling color laptops (utilizing a screen developed with Toshiba as a joint venture), and a host of network applications, including some hot video-conferencing hardware. IBM had even **more cool stuff** at Bally's. If this were five years ago (when IBM was the dominant force in the desktop computing community) and IBM had rolled out as many hot products, I believe that most competitors would have thrown their hands in the air out of frustration and quit the business. But that was then and this is now. Still, IBM was the **hottest company** at Comdex this year, and most people paid little attention. This, to me, reemphasized how much of a salesman's show this had become. The belated Apple laptops got more attention than anything done by IBM.

If IBM had rolled out as many hot products at Comdex five years ago, the competition would have quit out of frustration.

The most interesting box released by IBM was its PS/2 Ultimedia Model M57 SLC. This is one great machine. Utilizing the **special IBM 386SLC** (a speedy, cached 486-like chip designed by IBM), this machine was as loaded as possible. With a new 16-bit sound system built-in, a fast CD-ROM/XA drive, XGA graphics, IBM SCSI, and a 2.88MB 3.5-inch floppy disk drive, this was the machine to drool over. **The definitive box**, for sure.

Lotsa Laptops Dept.: The show was filled with them, especially the boxy A4 laptops. Everyone had one. The key to the **future of laptop computing** may be more complex than marketing a me-too machine, but instead doing what BCC did with its SL007. It made it **beautiful** with a contemporary design and a scratch-proof finish. The BCC is loaded with a 60MB hard drive, 9,600-bps fax modem, and a stunning 10-inch VGA screen. It's competitively priced at \$4,995. Call them at 408-944-9000 for more information.

Incidentally, BCC is the new moniker for the company. It was started by an MIT grad as the **Beaver Computer Co.** (the beaver being the MIT mascot). Needless to say, the element of **potential ridicule** determined the new name. You can make up your own jokes. ■

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Memory (Std./Board Max.)	2MB/16MB	4MB/32MB	4MB/32MB	4MB/64MB	8MB/64MB	1MB/10MB
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Jim Seymour



OOP Will Make *Our* Lives Easier, Too

While everyone hails the benefits that object-oriented programming has in store for software developers, the real promise of OOP will be enhanced productivity for users.

There's not much question anymore that object-oriented techniques are the future of programming in the PC world. The arguments in favor of object-oriented programming, or OOP, are simply too strong. That powerful role for OOP has brought a phenomenal amount of attention to what is, after all, a relatively obscure technique in a little-reported, little-understood corner of the computer business.

But as so often happens when the light of publicity falls on some aspect of a technology business, the greater contribution—the real reason we should be paying attention to OOP—gets lost in the shadows.

I'm impressed with the contributions OOP can make to commercial programming. But I'm much more impressed with how it's going to allow us to effectively personalize commercial, off-the-shelf packages.

For years we've dreamed of being able to reconfigure applications to make them work "our way." We've seen gestures in that direction—some good enough to make us realize how important full-blown personalization could be. The user-configurable "toolbar" in *1-2-3 for Windows* is a good example: Being able to move the icons representing the commands we use most (as opposed to those a committee at Lotus thought we'd use most) is an immediate and direct contribution to productivity.

This didn't start with Lotus Development Corp., of course. *Microsoft Word* offers users dozens of options on program settings, from tab-depth to foreground and background colors on-screen, to the level of detail you want to see in things like paragraph marks, spaces between words, and more. Other word processing programs offer many of the same user-customizable options. And Borland's *Quattro* introduced entirely reconfigurable menu systems: You can choose a 1-2-3-clone slash-bar menu, or use *Quattro*'s native, superior menu structure.

So that's not so new. But it's only a taste of

what will be possible with truly "OOP'd" applications. You don't have to understand the whole OOP schema, from objects down through classes and subclasses, to understand why that's so. But a quick overview of OOP will show why you'll like OOP-based applications so much.

One of the basic ideas behind the productivity gains of OOP techniques in programming is that coders can build reusable modules of code—little lumps of code, each devoted to a single, simple task, that can be strung together in millions of different ways to accomplish as many different tasks. (There's a lot more to OOP than that, but it's enough of an explanation for our purposes here.)

Because new programs are built from these strings of well-tested and well-proven code modules, those new programs can be developed far faster than when programmers must re-create program structures line by line, all over again, for every new project. It's also easier to debug and maintain programs written from these modules since it's easier to test and confirm the modules' integrity.

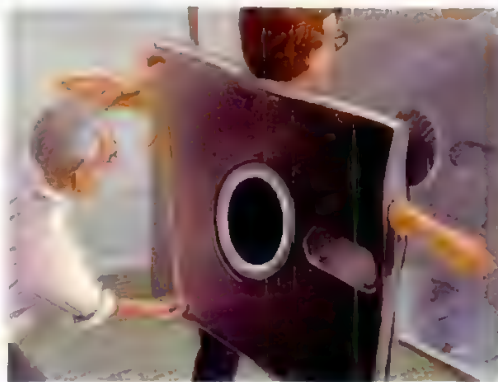
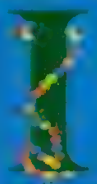


ILLUSTRATION: KEN CONDON

NOT FOR PROGRAMMERS ONLY

That same modularity will make OOP-based applications more easily and more completely user-configurable. Just as programmers can build OOP-based applications by stringing modules of code like so many beads on a wire, you and I will be able to restructure programs by making menu choices that will also restring those beads.

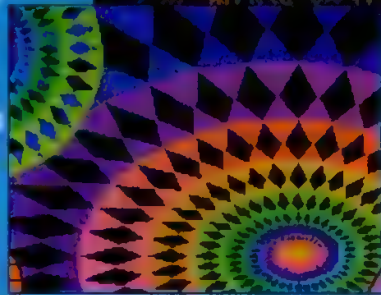
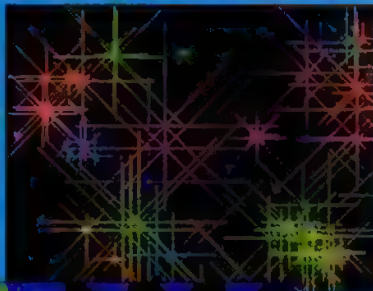
Programmers can thus make it easy for us to choose one way to do something, or another. They can even provide extra modules, not



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Jim Seymour

compiled into the basic program but grafted on by the end user.

Not everything I want to change about programs involves expanding their capabilities, though. I cherish the idea of stripping out the stuff I don't need—especially if I can second-guess myself a year later, and put those functions back in. That notion—creating slimmer, faster programs that do less by providing *only* what I need—is also part of the OOP revolution.

Another important contribution of OOP techniques will be to finally make commercial applications truly extensible. We've been talking for years about the importance of extensibility in shrink-wrapped programs, making it possible for users to add specific new functions or link dissimilar applications. But the PC software business hasn't delivered very well on that promise.

The first steps toward extensibility, such as the BASIC-like language in *Word for Windows*, have been useful. Some apps offer great extensibility to those who can write C code to latch onto hooks built into the program. But this kind of extensibility is much more a tool for the VAR or the full-time in-house corporate programmer than for the typical end user, who is unlikely to have the skill, interest, or time to develop meaningful extensions this way.

What we need are mechanisms embedded in programs that will make it really easy for users to develop extensions themselves. Or ways to make it practical for third-party developers to offer libraries of canned, ready-to-use extensions that graft onto extensible applications.

Quark Express's XTension architecture accepts such extensions. The next version of *PageMaker* will, too, through its new Aldus Additions design—a good example of competition driving product improvements. Even 1-2-3's add-ins have long allowed extension of the underlying program—although clumsily and without the kind of grace and facility we'll see in extensible OOP-based applications.

How important is this side of the OOP coin?

So much so that in the end, the impact of OOP will be measured less by its contribution to programmer productivity than to *user* productivity—gains that go more directly to how we use computers rather than how we build tools for them. ■

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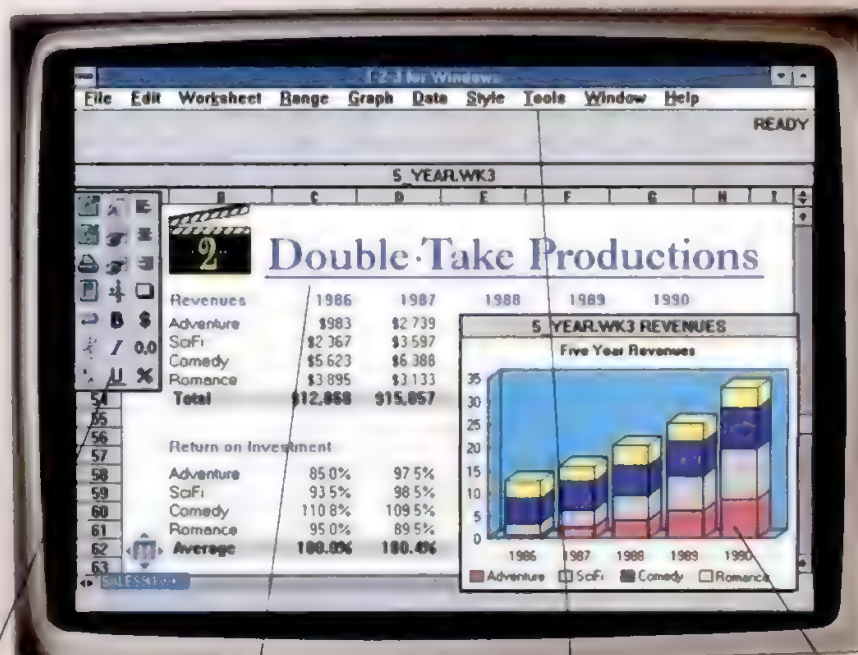
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Pure 1-2-3.

deliver a balance of power and simplicity. And third, make it fully compatible with the earlier versions of 1-2-3 that millions of users are familiar with.

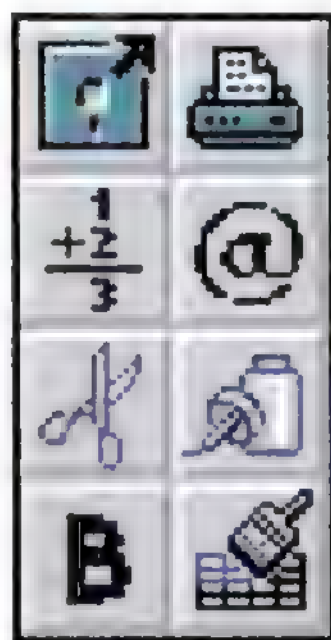
Well, we've done all this and more. Which is no doubt why 1-2-3 for Windows was awarded Byte Magazine's *Best New Windows Application* at Comdex/Spring '91.

One of the first things you'll notice about 1-2-3 for Windows is its SmartIcons™—simple, one-click shortcuts to performing common spreadsheet tasks. For example, sum a row of numbers, make text bold, create a graph, save or print a file, even run a macro—all in a single step.

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icons for the tasks that are unique to you.

And yes, 1-2-3 for Windows takes full advantage of the Windows environment, with pull-down menus, dialogue boxes, sizable windows, full DDE support and everything else you'd expect to find in Windows.



Customizable SmartIcons give you push-button access to basic and advanced spreadsheet functionality. Over 50 standard icons come with the program, or create new icons to suit your needs. For example, sum a column or a row, or change text to bold—all in a simple step.

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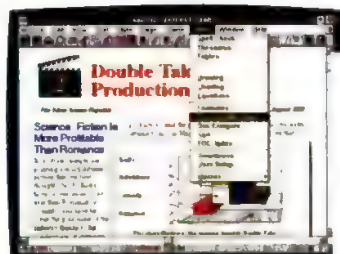
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William F. Zachmann



Here's Looking At '92

The rebirth of OS/2, a less-than-complete NT, and other trend-bucking predictions.

■ **Prediction 1: The move to 32-bit multitasking begins.** The big trend in 1992 will be the start of a serious migration to 32-bit preemptive operating systems on the desktop. That means fast growth for all the 32-bit operating systems, regardless of which proves to be the most popular.

■ **Prediction 2: The beginning of the end for MS-DOS.** The movement to 32-bit operating systems is one reason why the market share champion of the 1980s, MS-DOS (and PC-DOS), is on its way out. Another is the strong and serious challenge from DRI/Novell with DR DOS. MS-DOS's market share will be significantly lower by year's end. That will be the beginning of a steady decline over the next few years.

■ **Prediction 3: A big shakeout for Windows applications vendors.** Software vendors rushed to Windows with more enthusiasm than users. Major disappointments lie ahead as the vendors discover there aren't enough Windows users to buy all the Windows apps they hope to sell.

■ **Prediction 4: Windows NT will be late and short.** Microsoft's ambitious Windows NT effort will fall prey to the problem of most big software projects: It will be late. Mid-1992 delivery of the finished product isn't even a remote possibility. Chances are that it won't ship before early 1993 and will lack many of the promised capabilities when it does.

■ **Prediction 5: Unix gains ground.** Unix alternatives to DOS will continue to gain ground. Sun's Solaris, in particular, may give Unix a substantial boost in the office. The Unix flavor of the ACE hardware initiative will also help. Like the tortoise in the race with the hare, Unix will continue its steady progress.

■ **Prediction 6: X/Windows claims key market niche.** X/Windows will take its place as an important niche product that enables Intel-based personal computers to connect with larger Unix systems. It won't become the primary foundation for networking, but will be an important option.

■ **Prediction 7: Success (finally!) for OS/2.** IBM will finally make it with OS/2 2.0 and have a success comparable to Windows 3.0's in its first year. OS/2 2.0 will sell 3 to 4 million copies, get back on track as the likely succes-

sor to DOS, take the wind out of Windows' sails, and thoroughly confound skeptics.

■ **Prediction 8: A tough year for Microsoft.** All of the above adds up to a tough year for Microsoft. Late with Windows 3.1, late with Windows NT, under attack by competitors on all sides, vulnerable to possible legal troubles with Apple and the FTC, Microsoft will find that revenues and earnings, too, fall short of expectations in 1992.

■ **Prediction 9: US/EEC/Japan trade wars escalate.** Pressures from worldwide economic problems and an election year in the U.S. will combine to exacerbate international trade tensions. Trade wars will escalate among the U.S., Japan, and the EEC. Users will be the losers, paying more to get less.

■ **Prediction 10: EISA hits the mainstream.** Cheaper chip sets and the move to 32-bit systems will make EISA a mainstream product. EISA system boards will become a standard feature of midrange systems sold by just about every vendor but IBM. The EISA market share of systems sold will climb sharply.

■ **Prediction 11: Apple back on track in corporations.** Apple, bolstered by its far-reaching agreements with IBM, will get back on track in corporations. The Mac is still the easiest system to use for people (including executives) who aren't comfortable with computers.

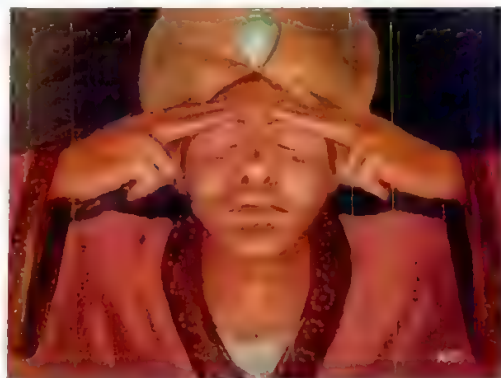


ILLUSTRATION: KEN CONDON

■ **Prediction 12: Borland a big winner.** A strong early position with C++ and a deal with IBM to provide 32-bit development tools for OS/2 2.0 will give Borland a big boost. These factors, combined with a strong presence in the database and spreadsheet markets, make Borland likely to be one of the most successful software vendors of 1992. ■

Proof You Gain Weight



*Weight, which includes battery, varies with hard disk size. Suggested retail prices subject to change without notice. © 1992 Everex Systems, Inc. All rights reserved. EVER for EXcellence is a registered trademark, and Everex and Tempo are trademarks of Everex Systems, Inc. KeyMouse is a trademark of KeyTronic, Inc. (Technology licensed from Home Row Inc.) The Intel Inside logo is a trademark of Intel Corporation. Other company and product names are the registered trademarks of their respective holders. GSA Schedule #GS00K91AGS5073.

Don't Have To To Add Muscle.

TEMPO

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It weighs in at less than five and a half pounds. Yet, when it comes to performance, the Tempo™ Carrier™ Notebook from Everex™ is anything but a lightweight.

Like its predecessor — our critically-acclaimed Tempo LX — the Tempo Carrier offers a collection of features you won't find in any other comparably-priced notebook.

For starters, it's powered by a serious 20MHz i386SX™ processor. And with up to 8MB of RAM and your choice of a 40MB or 80MB internal hard drive, the Tempo Carrier delivers more muscle than some of the mightiest desktop PCs.

All of which means it's strong enough to run through all your Windows™ OS/2 or DOS applications from just about anywhere you happen to be working. Because, as one of the smallest high performance notebooks ever created, the Tempo Carrier fits into a space half the size of this ad.

But building a smaller footprint wasn't our only objective.

In fact, the Tempo Carrier is the world's first notebook to integrate the amazing new KeyMouse™. This keyboard-controlled pointing device completely eliminates the need for an external mouse or trackball. (If you've tried to use a mouse on an airplane, you know the advantages of that.)

Eliminating the weight, bulk and hassle of an external mouse or trackball, the unique KeyMouse uses the pressure-sensitive "J" key to control your cursor movement in any direction.

However, if you still prefer to use a traditional mouse, the Tempo Carrier



The Tempo Carrier \$2,795

- Intel386™SX, 20MHz CPU
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- VGA Backlit Display
- Multi-Level Power Mgmt. System
- 1.5-Hour Quick Charge
- 80-Key Keyboard with "KeyMouse"
- 2MB RAM (Expandable to 8MB)
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- 1.44MB 3.5" Internal Disk Drive
- 80387SX Math Coprocessor Socket



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- Intel386™SX, 20MHz CPU
- 7.1 Lbs (Including Battery)*
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- 2-3 Hours Battery Life
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includes a free Microsoft®-compatible mouse. We've also included two serial ports — so you'll still have an additional port free for an external modem, a portable numeric keypad or another serial device — as well as a parallel port, keyboard port and external VGA monitor port for total flexibility.

Speaking of monitors, the Tempo Carrier offers one of the brightest VGA screens in the industry. Our high speed 640 × 480 LCD delivers clear, backlit resolution and 32 shades of grey to help you create desktop-quality spreadsheets and graphics.

And to ensure that you work as productively as possible, our Multi-level Power Management System controls power to the display, hard disk and serial ports for the most efficient use of battery charge. It also provides battery saving Suspend/Resume and SmartSleep

FOR ADDITIONAL INFORMATION CALL:

1-800-437-EVER

In Canada (1-800-661-2003)
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capabilities, as well as password-only access for reliable data security. It even allows you to set "hands free" operation by scheduling precise power-up times or enabling incoming modem calls to activate the system.

Considering all the features of the Tempo Carrier, it's hard to believe we loaded so much into such a lightweight package. Even when you combine the system, battery, AC adaptor and power cord into your free padded carrying case, you'll still have a total weight of just 8.2 pounds!

Perhaps the only thing more impressive than how light we kept the weight is how lean we kept the price. In fact, the Tempo Carrier even keeps your budget in shape.

FREE WITH YOUR PURCHASE:

Microsoft® Windows™ 3.0	\$145 Value
MS-DOS® 5.0	\$130 Value
Microsoft®-compatible Mouse	\$79 Value
Carrying Case	\$69 Value

Total Value of \$423

Limited offer through January 31, 1992

One year parts & labor warranty (includes 48-hour turnaround and free overnight pick-up and delivery within the Continental U.S. only).

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EVEREX
EVER for EXcellence™

If you've wished your WordPerfect[®]

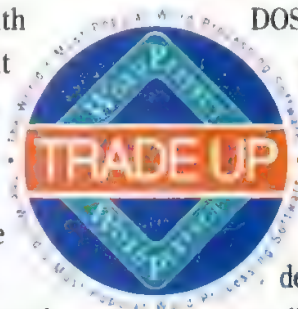


Maybe your old word processor is a bit out of date. Perhaps the files aren't compatible with other word processors in your office. And it probably just doesn't have the power or the features of WordPerfect[®].

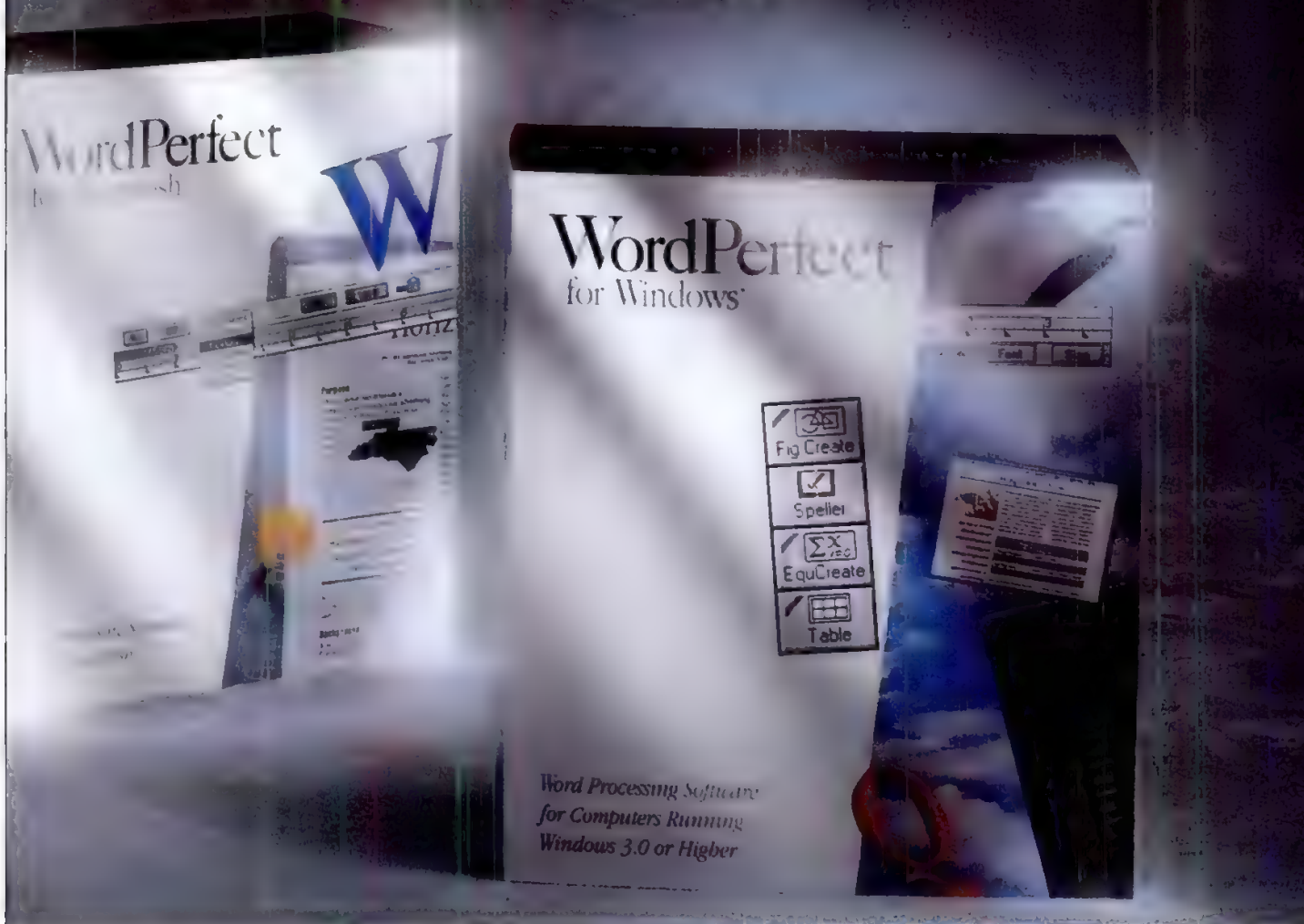
But it may still serve a purpose: because now, for a limited time, you may be able to turn your old word processor into a WordPerfect word processor. Just trade it in and get substantial savings on the WordPerfect version of

your choice. And if you haven't made the choice between DOS, Windows and OS/2, that's fine. Because when you trade up to WordPerfect, you can be licensed to use all three on one machine.

To take advantage of this special trade-up offer, you don't even have to give us your old software. Just show your WordPerfect dealer a proof-of-purchase such as your manual or a diskette from your old word processor, and you're all set.



word processor were you're in luck.



Each trade-up offer is a little different, depending on the WordPerfect version you want.

Users of certain DOS, Windows, and Macintosh word processors can trade theirs in to get the corresponding WordPerfect product for just \$150 (\$179 in Canada). You can even get LetterPerfect[®] for just \$89 (\$110 in Canada) when you trade in one of the appropriate word processors. And we also have a trade-up offer for those of you on UNIX, VAX or Data General machines.

If you want to know if your specific word processor

qualifies you for this limited offer, just call us at (800) 526-5012. We'll tell you if a trade-up offer is available for your software and give you more information about the version of WordPerfect you're interested in.

This offer ends on March 31, 1992. So don't wait to turn your old word processor into WordPerfect. The perfect time is now.

WordPerfect
CORPORATION

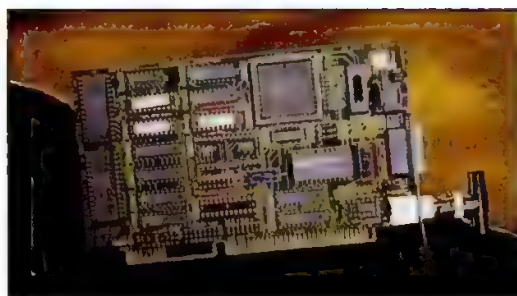
NOW'S THE PERFECT TIME

THE BEST OF 1991 COVER STORY

Are you better off with a computer now than you were ten years ago without one? The answer, as with many other things in regard to the PC, is a definite maybe; it all depends.

If you or your company works with reams of numbers, there's no question that *Microsoft Excel* is a day-and-night improvement over struggling with the adding machine of the 1970s or living at the mercy of a rudimentary spreadsheet on the mainframe or minicomputer ("Let's see, if I stay through lunch when everyone else is out, maybe I'll get better response time from the VAX").

The same is true of *Aldus Persuasion*, Lotus Development Corp.'s *Freelance*, and Software Publishing Corp.'s *Harvard Graphics*. When you compare these products with Issco Tell-A-Graf or the prospect of drawing a chart by hand, you are far



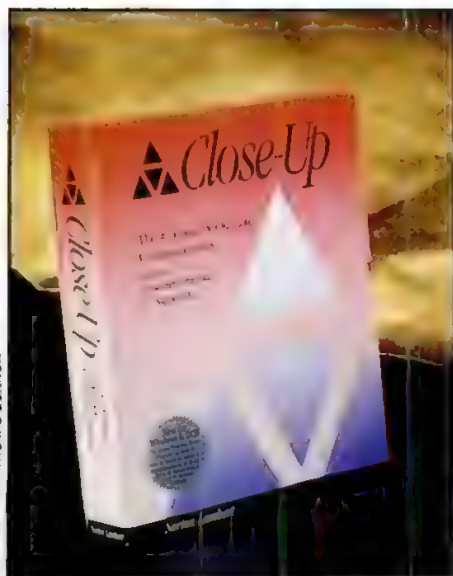
IN THIS REVIEW

- | | |
|--|---|
| <i>Aldus PageMaker 4.0 for Windows</i> | <i>Motorola Codex 3260 Multimedia Beethoven</i> |
| Artisoft AE-3 Ethernet | Multimedia Extensions for Microsoft Windows 3.0 |
| Borland C++ 2.0 | NEC MultiSync FG series monitors |
| <i>Close-Up, Version 4.0</i> | <i>The Norton Utilities</i> |
| DEChub 90 | <i>On Target, Version 1.0</i> |
| Digital Palette CI-3000 | <i>PC Tools, Version 7.1</i> |
| HP LaserJet IIIP | <i>Q&A, Version 4.0</i> |
| HP LaserJet IIISi | <i>Secret Weapons of the Luftwaffe</i> |
| HP ScanJet IIc | <i>WinFax Pro</i> |
| <i>Instant ORGcharting!</i> | <i>WinPost, Version 3.1a</i> |
| <i>LHA, Version 2.13</i> | <i>Zortech C++ Developers' Edition, Version 3.0</i> |
| <i>Mathcad, Version 3.0</i> | |
| Pro AudioSpectrum | |
| <i>Microsoft Money</i> | |
| Microsoft Windows illustration software: | |
| ■ <i>Arts & Letters Graphics Editor, Version 3.1</i> | |
| ■ <i>CorelDRAW, Version 2.01</i> | |
| ■ <i>Designer, Version 3.1</i> | |

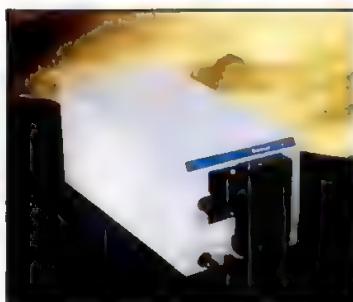
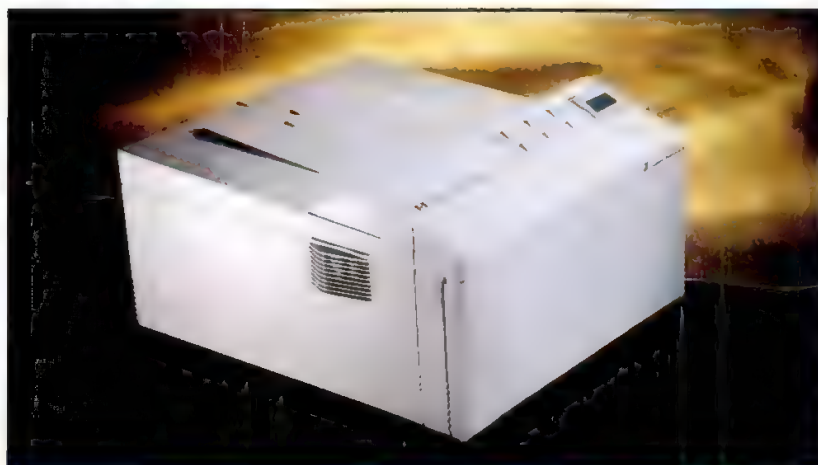
BY BILL HOWARD



Now, a decade after IBM introduced the personal computer, everything is faster, smaller, and cheaper. But are things really better? Are you more productive? PC Magazine looks at some of the products and trends that help power your PC.



PHOTOGRAPHY THOM O'CONNOR



better off; ditto for *WordPerfect*, Version 5.0, versus a *Selectric*. Notice, though, that many of these advances occurred early in the 1980s. *Lotus 1-2-3*, Release 1a, was a quantum leap above an adding machine, but Release 3.0 was a less radical improvement over Release 1a. Anyway, yes, you are in a better position with these products.

Nothing comparable to desktop publishing or even multifont, proportional-type laser printing existed ten years ago; certainly nothing comparable if you didn't have several hundred thousand dollars to buy your own typesetting system and set up your own composing room. Are you better off now? Yes. But in terms of coordinating meetings, moving messages around, keeping the data in the Des Moines office in sync with the data at the head office in Chicago, group brainstorming, and reducing the nonstop blizzard of paper—all the things that together make up the day-to-day grind of a typical office—are you really any better off? Hardly.

FASTER, BETTER, CHEAPER, EASIER?

The promise of the personal computer was faster, better, cheaper, and easier productivity. A 33-MHz 486 machine executes instructions 35 times as fast as the original IBM PC or XT, but a *Word for Windows* document doesn't scroll down the screen any faster under Microsoft Windows, Version 3.0, than a *WordStar* 3.3 document did under DOS, Version 3.0. If better means more reliable, the technology is getting better; it's not uncommon for a PC to run three years or longer without a component failure. That's if you can get the machine configured when it arrives and supported when it does break. Cheaper? That's an unabashed win for the buyer.

Easier? There's the rub. Microsoft Windows 3.0 represents the epitome of ease of use compared with what we endured prior to its existence, but PC users are trapped in the Dark Ages

EDITORS' PERSONAL BEST: HONORABLE MENTIONS

PC Magazine's editors and contributors liked these products, too.

ALPHA FOUR, VERSION 2.0: All the ease of use of a good flat-file database, and it's relational.

APPOINT THUMBELINA: A mini-trackball great for sequencing laptop-based presentations.

DR DOS, VERSION 6.0: Novell gives it instant credibility, and Microsoft needs the competition.

EPSON LQ-570/LQ-870/LQ-1170: Scalable-font dot matrix printers, available only in a few point sizes and only for a few applications (not even Microsoft Windows).

MICROSOFT WORKS FOR WINDOWS: Possibly the only program that many Windows users will need.

ON TIME: A smart scheduler from Campbell Services with gorgeous Windows screen displays but clunky output.

PAGEAHEAD: A super-smart formatter that makes business data look its best before it gets poured into *PageMaker*; worth the \$795 price.

PANASONIC KX-P2624: The world's quietest dot matrix printer.

PROXIMA OVATION: Real color from an LCD panel. Got \$8,000 to spare?

VELLUM: Ashlar has developed a smart CAD program that works with you, although it's slow.

on an absolute scale of ease of use and are still in the Bronze Age when compared with what the Macintosh environment offers.

If the PC is an instrument of social change (pardon us for just one paragraph while we put on our 1960s we-can-change-the-world, tie-dyed shirts), it's been a revolution that benefited the developed countries more than the third world. PCs have done more to help Japanese restaurants track their air-freight deliveries of \$100-per-pound tuna than to help overworked hospital staffs in Africa track supplies. If the PC is a brain amplifier, most of the amplification has been on behalf of the haves rather than the have-nots. But enough about the past and where we've been and haven't been. Here's a look at where we're going.

CONNECTIVITY

Most local area networks, even *NetWare* LANs, connect just a dozen people, and for these

smaller networks, Artisoft's *LANtastic* provides a more-intelligent solution than the complexities of Novell's *NetWare*. Thus, we've seen the surge of low-end LANs this year from famous names: *NetWare Lite* from Novell and *LANstep* from Hayes Microcomputer Products.

Apple Computer Corp. had the right idea when it built rudimentary networking into its operating system and a slow AppleTalk network connection into the computer. PCs are finally catching up to the Macintosh environment. For example, look for unshielded twisted-pair Ethernet connections (10BaseT) built into the motherboards of some PCs this year. 10BaseT is the hottest, simplest, cheapest way to get high-performance connections, and the parts cost the manufacturer less than \$25.

If your next PC has built-in Ethernet and your next laser printer has a direct Ethernet attachment, you could use that as your printer connection and eliminate one of the biggest per-

formance bottlenecks in printing: the serial or parallel cable. As a representative of Sun Microsystems notes, "Ethernet is the serial cable of the nineties."

Microsoft Corp. is making a lot of noise about building rudimentary networking abilities into DOS, Version 6.0. Meanwhile, Novell bought the DOS competitor DR DOS and announced plans to distribute it with some versions of *NetWare*; Novell gives DR DOS the credibility it lacked as a Digital Research product. This is an interesting matchup: Microsoft puts networking into its operating system, so Novell puts the operating system into the network. Perhaps Microsoft will have better luck with networking built into DOS than with its standalone OS/2 LAN Manager, which has been a poor second to *NetWare*.

Modem and fax communication remains a problem area because the software is almost universally lousy and hard to use. We are years away from the time when sending data will be as easy as making a voice telephone call. The good news is that the messages you find near-impossible to send will transmit much faster if you figure out how to send them. For communication over phone lines, 9,600-bit-per-second and 14,400-bps modems (V.32 and V.32bis, respectively) have emerged as the best products to buy, now that you can find them selling for less than \$500.

Unfortunately, many of the e-mail and on-line services (MCI, Prodigy, CompuServe) have been slow to adopt the higher-speed modems or have only adopted them partially—for instance, without the data compression that could quadruple modem speed. AT&T Computer Systems' new V.32bis modem and fax chip set will lead to high-speed modems from many vendors that fit into laptops or plug into the back. Also look for fax capabilities in a greater number of internal modems; the cost of adding fax capability is marginal. More high-speed modems will appear more frequently in internal versions, because some research suggests that the external serial ports on many PCs can't supply data to a modem fast enough to keep up. It's good to see the external modem's blinking lights, but not if this costs you a third of your throughput speed.

Wireless communication will be a bigger part of your future. Hewlett-Packard Co. and AT&T have wireless pagers that can download data into a computer. Today the technology is slow, receive-only, and limited in how many messages it can handle; tomorrow may be another story. Texas Instruments believes that by the middle of this decade, cellular phones will be capable of data transfer rates approaching 1 megabit per second. Several companies make wireless LANs for use if you're in an office where it is physically impossible to use cables, or if you're in a location for only a few months.

The single hottest network issue may be the question of li-

censing applications software for use across networks. Businesses want to be able to buy a site license (\$10,000 for all LAN users, for example) and will settle happily for concurrent-user licenses (\$7,500 for any 50 people using the software simultaneously). But companies will refuse to buy LAN software requiring a separate purchase for each named user (\$295 per package for each of the 100 users in the company).

PCs, LAPTOPS: FAR FROM COMMODITIES

Among desktop PCs there's considerable performance parity among brands. Pick any 33-MHz 386 machine and it will run within 3 to 5 percent of the speed of any other 33-MHz 386 on the market, but that doesn't make them commodities. There continue to be wide differences in reliability, technical and maintenance support, and manufacturer compatibility testing for a variety of add-in cards and programs. Technically, however, no one has a significant advantage.

Industry Standard Architecture (ISA) remains the dominant desktop standard, while Micro Channel architecture (MCA) has settled into being an IBM-only standard. On the desktop, the advantage of Extended Industry Standard Architecture (EISA) has been hard to prove, especially since EISA add-in cards are so few and so expensive. EISA video cards may be the first breakthrough in showing an EISA speed advantage, although you can get most of the same advantages with local-bus video on an ISA system—*local bus* meaning that the video circuitry is on the motherboard but not on the now-antiquated 8-MHz system bus. Our advice: Go for EISA if the price premium is \$250 or less. Regardless of price, EISA (or MCA) is the way to go if you're buying a file server.

Even with so little real estate to work with, laptops vary widely from maker to maker. Today, the state of the art is 5 to 6 pounds with a 20-MHz 386 processor and a 60MB to 80MB hard disk. Color is coming on strong, and by mid-1992 you should have a dozen color models to choose from—some with battery power. Unfortunately, the good color models (containing active matrix displays) still carry a \$2,000-plus price premium. This year we'll see the first slate computers, and they won't differ much from laptops. Until high-quality pen software arrives (after 1992), most slate manufacturers will build machines with keyboards or keyboard connectors.

As laptops surge toward a one-third share of the PC market, the United States may be ceding yet another market to the Japanese. The fraction of value added by American companies is far less with laptops than with desktop PCs.

PRINTERS, MONITORS: COLOR, COLOR, COLOR

If there's any dissatisfaction with computers, it isn't because of the hardware. Thousand-dollar laser printers, 100MB hard

disks no larger than audiocassettes, and high-resolution multi-scanning color monitors are simply wonderful, and wonderfully affordable. Passable color ink jet printers are currently available for \$1,000-to-\$2,000 list prices, and high-quality PostScript printers (available for \$5,000 to \$15,000) are gaining increasing popularity as more high-quality Windows-based graphics programs become available in the marketplace.

The exception lies with video cards. There is simply no video card available today that makes Windows seem quick. Is it the fault of the video card or the code underlying Windows? Possibly the code is more to blame than the card. If Windows seems too slow, try one or more of these fixes: Invest in a higher-performance video card, invest in a PC with local-bus video or EISA-bus video (not all video on the motherboard is local-bus video), invest in a third-party video driver (sometimes called a video accelerator), or get the latest video driver from your video card manufacturer. The quality of the driver has as much to do with speed as the quality of the card itself. If your video card has its own VGA driver (640 by 480 with 16

colors), use that instead of the generic VGA driver supplied with Windows. It may be faster, and it definitely won't be slower.

Drivers are an issue with laser printers, too. Adobe Systems is so dissatisfied with some of the drivers written for PostScript printers that it's writing its own and will make them available to users of new and existing PostScript printers.

SOFTWARE: WHERE'S THE BEEF?

If you recall the "How to Buy Your First PC" articles popular in magazines one decade ago, the advice always included this pearl: "First decide what program you're planning to run, then buy a microcomputer that can run that program." Today software still makes more of a difference than hardware. The many advances made in the power of software haven't been matched by increased ease of use. Spreadsheet programs don't understand that "Q1 Q2 Q3 Q4" in cells B1 to E1 have a special meaning, and no word processor can walk you through a mail-merge, inserting variables and then letting you point to the data fields in an external database. There are thousands of

8TH ANNUAL AWARDS FOR TECHNICAL EXCELLENCE

Here are the finalists and winners for *PC Magazine's* Technical Excellence Awards for 1991 (*PC Magazine*, December 31, 1991). These products are also among the best of 1991.

STANDARDS AND OPERATING SYSTEMS

- Winner** • GO Corp.
PenPoint
- Finalists** • Apple Computer Inc.
Macintosh System Software, Version 7.0
- Microsoft Corp.
Microsoft Windows for Pen Computing
- Microsoft Corp.
MS-DOS, Version 5.0

DEVELOPMENT TOOLS

- Winner** • Microsoft Corp.
Microsoft Visual Basic
- Finalists** • Borland International Inc.
Turbo Pascal for Windows
- Within Technologies
Realizer

UTILITIES

- Winner** • Stac Electronics
Stacker, Version 1.1
- Finalists** • Adobe Systems Inc.
Adobe Type Manager for Windows
- Symantec Corp.
Norton Desktop for Windows
- Quarterdeck Office Systems Inc.
QEMM-386, Version 6.0

APPLICATIONS SOFTWARE

- Winner** • Fox Software Inc.
FoxPro, Version 2.0
- Finalists** • Aldus Corp.
Aldus Persuasion, Version 2.0 for Windows
- Lotus Development Corp.
Ami Pro, Version 2.0
- Autodesk Inc.
Autodesk 3D Studio
- Microsoft Corp.
Microsoft Excel, Version 3.0 for Windows

PORTABLE COMPUTERS

- Winner** • Toshiba America Information Systems
Toshiba T2200SX
- Finalists** • AT&T Safari Systems
AT&T Safari NSX/20
- Hewlett-Packard Co.
HP 95LX

PRINTERS

- Winner** • Lexmark International Inc.
IBM LaserPrinter 10
- Finalists** • Citizen America Corp.
Citizen PN48 Notebook Printer
- Tektronix Inc.
Tektronix Phaser III PXi

CONNECTIVITY

- Winner** • Motorola Inc.
Altair Wireless Ethernet
- Finalists** • Beyond Inc.
BeyondMail, Version 1.0
- Crynwr Software
The Clarkson Packet Driver Collection
- Novell Inc.
NetWare, Version 3.11
- Shiva Corp.
Shiva NetModem/E

AFTER HOURS

- Winner** • Maxis (distributed by Broderbund Software Inc.)
SimEarth
- Finalists** • Dycam Inc.
Dycam Model 1 Digital Camera
- Access Software Inc.
Links: The Challenge of Golf
- National Geographic Society
Educational Media Division
Mammals: A Multimedia Encyclopedia

PERSON OF THE PC DECADE •

Philip D. (Don) Estridge

PERSON OF THE YEAR •

Philippe Kahn, CEO, Borland International Inc.

LIFETIME ACHIEVEMENT •

Daniel Bricklin and Robert Frankston

Effortlessly contour and colormap surfaces generated from random sample points.

Pull a lever to adjust a variable, as the revolutionary Graphics Equalizer™ animates changes to your curve-fits and formulas on-screen

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View and organize entire presentations at a glance with the visual slide sorter

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Finally...presentation graphics with numerical clout!

Does your presentation software give you all beauty and no brains? Where is the substance behind those pretty pictures? What if your presentation program had enough data-handling muscle to meet the needs of business and statistical and scientific users?

Presenting Stanford Graphics for Windows, the first graphics package to offer both state-of-the-art presentation features and powerful analysis capabilities.

With on-screen curve fitting, formula solving, statistics, and data manipulation, Stanford Graphics advances both the art and science of technical presentations.

"Stanford Graphics offers the best of both worlds. It combines top-notch presentation features with unprecedented technical sophistication. We were greatly impressed."

—Infoworld,
Sept. 16, 1991



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STANFORD GRAPHICS

CIRCLE 527 ON READER SERVICE CARD

examples of how PC software can be written without real ease-of-use. Ease of use often turns out to be a matter of who has the best telephone support department (a prime example: *WordPerfect*).

Software companies aren't evil, and they know ease of use is a problem. But it's going to be some time before you get products that are truly easy to use, unless you settle for some of the no-hassles, no-features, no-power programs. Software companies aren't invincible, either. If you look at the market-share leaders of five years ago or the market-share leaders at the dawn of the PC era, when the market consisted of Apple and CP/M, it's not a pretty sight. Ashton-Tate Corp. collapsed of its own obesity and inability to produce bug-free upgrades of *dBASE*. *Multi-Mate* never got beyond its status as a Wang clone, and ultimately suffered a fate worse than death: It was bought out by Ashton-Tate. MicroPro, now known as WordStar International, dithered around for over three years before upgrading *WordStar*, Version 3.3. Who's in danger now? One possibility: Software Publishing Corp., which let *Harvard Graphics* get awfully long in the tooth.

This year is the year of Windows applications. Last year, only two of the top ten software applications ran under Windows; this year, it will be ten out of ten. One perplexing issue is that while Windows is supposed to be easier to use, some of the first products aimed at mid-level users—the personal word processors *Professional Write Plus* (Software Publishing Corp.) and *Just Write* (Symantec Corp.)—have suffered miserably poor sales.

SAFETY AND BIG BROTHER

Safety and comfort issues bubbled on the back burner. Monitor manufacturers scrambled to produce lower-emission monitors. Newer video cards reduced flicker by raising the refresh rate from 56 Hz or 60 Hz (56 or 60 complete screen images painted each second) to 70 Hz or 72 Hz. The improvement is

AFTER HOURS: HONORABLE MENTIONS

ANDREW TOBIAS' TAXCUT: Good tax advice—good for a computer, anyway.

WHERE IN THE WORLD IS CARMEN SANDIEGO? DELUXE EDITION and **WHERE IN AMERICA'S PAST IS CARMEN SANDIEGO?**: Entertaining and educational. What more could you ask of a game?

KID PIX: A surefire program, once Broderbund Software kills the last few bugs.

MEDSURE: Tracks your medical expenses and makes sure you don't miss out on your reimbursements.

NEWTEK VIDEO TOASTER: Computer-based video editing and SFX system, cheap enough for PC users to buy the required Amiga. The output is passable, not great.

QUICKEN, VERSION 5.0, and **QUICKEN FOR WINDOWS:** Easy personal finance; not quite as easy as *Money*, but with more powerful features.

SPINNAKERWORKS: Simple but elegant integrated software for Microsoft Windows.

TANDY CDR-1000 CD-ROM DRIVE: Slow access times, but it's multimedia-ready, and the \$399 price is right.

TURBOTAX: The best product for filling out your taxes. Look elsewhere for advice (preferably to a person).

especially evident under Windows with white backgrounds. So don't settle for less than 70 or 72 Hz. Both your video card and monitor must support the higher rates.

Then there are the lesser comfort/ergonomics issues: Most PCs and keyboards are plunked on top of standard office desks that are 3 to 4 inches too high for comfort, causing discomfort and possible back problems. In offices with poor ventilation or a single thermostat for the entire building, all the PCs, printers, and monitors generate enough heat to make the office uncomfortable for many workers.

For some office workers, the health issue extends beyond physical well-being to emotional well-being. Remote monitoring software on PC LANs (and larger computers) helps businesses track the efficiency of their service em-

ployees: how many records are keyed into the database, how many phone calls are made out of state after 6:00 P.M., are they business or personal calls, how many e-mail messages are sent to people outside their workgroup (budding office romances?), how many times is the keyboard inactive for more than 5 minutes, what components are installed in each PC (is the employee trying to stock a home PC with office PC peripherals?), and so on. To the company, this maximizes efficiency and security; to the staff, it can smack of snooping. It's an issue that won't go away. And then there is the matter of telephone caller ID (which reports the caller's phone number to the person answering), although it's not directly a PC issue. If you're a customer of Bright Bilge industries, caller ID is great because it helps pull your account information to the screen when you call for help; it's not so great if you call for a free six-month baby magazine subscription and the publishing company resells your phone number a few weeks later to every crib maker, shoe bronzer, and baby photographer in your hometown. All this underscores one issue: Technology is neither moral nor immoral but amoral. It does what it's directed to do.

Hewlett-Packard offers straight-talk about Windows.

NewWave for Windows makes your PC work the way you've always wanted it to. At a price that's worth talking about. Only \$89.

The Desktop Organizer:

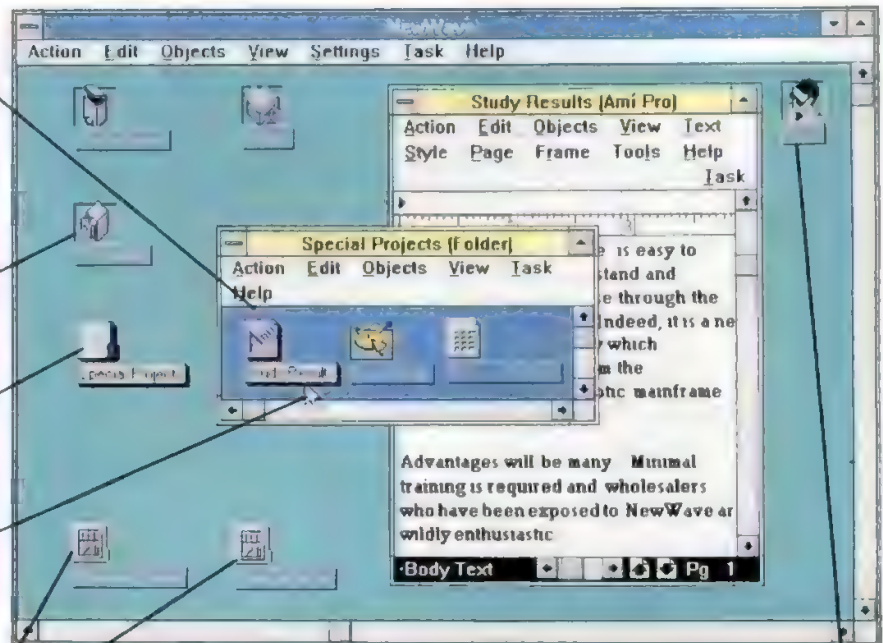
Icons: NewWave turns all of your existing DOS and Windows programs and files into icons for an easier-to-use desktop. Files can have 32 character names. Easily move files around the desktop by "dragging and dropping."

File Cabinet: On your real desk are documents in folders. Your folders are in a file cabinet. NewWave organizes your PC desktop the same way – by project with folder icons, and with a file cabinet for storing folders.

Folders: Finally, you can file your spreadsheet, word processor and graphics documents together by project, for easy access.

Launch & Load: Just click on an icon – both the file and it's program open simultaneously – NewWave has linked them together automatically. This means you no longer need to understand the Windows program and file managers to get your work done.

The Work Group Library makes it easier for you to share information with co-workers. We've done away with network menus and DOS commands, so you can focus on what you want to do – to share information with colleagues as you work together on the same project. To share text, graphics, and even spreadsheets, simply drag the file icon onto the server icon and your document is immediately available to others on your network. NewWave will track revisions, as well. So an entire group can work on your project and you will know when data has been changed and who has changed it. Welcome to document sharing, the easy way; the NewWave way.



NewWave's Agent brings automation to Windows. Let "The Agent" watch you complete a task just once, like the monthly update of a budget or sales report, and he'll complete the same job for you again and again using your existing software applications. You can even automate "The Agent" to work across applications and networks to gather the information you need. And he's far easier to set up than the Windows' macro-recorder – because he remembers your steps while you execute them and allows you to edit right then or make changes later. By using his calendar, you can schedule work for him days or weeks in advance. Just think of how much extra time you'll save by turning "The Agent" loose on all of your recurring tasks.

Put NewWave to work for your organization and find out how easy it is to get more done. Now it's only \$89. At a price like this it pays to be organized.

Call 1-800-848-WAVE ext. 1H and get NewWave for only \$89* (suggested retail price \$195). But only if you call before 1/30/92.

*Limited time offer. Limit one per customer.



NewWave for Windows.
We've made a great idea even better.



WAIT TILL NEXT YEAR

The Intel CPU standard is under attack from Apple, Unix, and RISC processors. Apple Computer Corp. has eroded many of its price and performance disadvantages since the 1980s; it finally has portable portables, and it has the game-set-and-match ease-of-use advantage over DOS and Windows. However, businesses are still troubled by the narrow selection of Macintosh applications beyond word processing, spreadsheets, and graphics. RISC-processor Unix workstations, led by Sun's SPARC systems, seem to execute tasks faster than Intel PCs and have a good variety of applications, but as with Apple, nothing approaching what the PC offers.

Where are we headed? Ultimately, it's clear that DOS needs to be put out to pasture and replaced with something more robust, preferably something that still runs DOS applications as well as DOS always has. That, of course, was what OS/2 was supposed to be by 1990 or 1991.

The next standard operating system, perhaps Windows NT (New Technology), will embrace Intel-architecture CPUs, Intel clones (AMD, Chips and Technologies), and RISC processors. Your 1994 PC might have an Intel 80586 or a MIPS 4000 RISC chip or a variant of the IBM RISC 6000 chip. Regardless of what you buy, compatibility won't be an issue, just as DOS compatibility among Intel-architecture PC brands wasn't an issue once clone makers ironed the bugs out of their BIOSes in the 1980s. Other operating system contenders are IBM's go-it-alone OS/2, Version 2.0; Taligent; and the various flavors of Unix. While there are vast technical differences between OS/2 2.0 and Microsoft NT, to the user, much is the same in theory: Windows-style graphical interfaces, robust features, the ability to run new applications quickly and powerfully, the ability to run old DOS applications perfectly well. Further down the road is Taligent, the IBM collaboration with

Here is a list of products destined to be great, once they ship or get the last few bugs ironed out of their beta or early-release versions.

AT&T V.32BIS MODEM CHIP SET: Enabling technology for a \$500 low-power, 14,400-bit-per-second error-correcting modem and fax modem built into your laptop. Already available in a portable external modem (Telebit).

ATI ULTRA: A superfast, superaffordable coprocessed video card.

DOLCH P.A.C. 486-50E: A Cray with a handle? A great idea once Intel Corp. rereleases its 50-MHz chip.

FREELANCE FOR WINDOWS from Lotus Development Corp.: *Aldus Persuasion's* equal or better.

LOCAL BUS VIDEO: The first implementation (by NEC Technologies) was fast when it should have been hyperfast. Maybe when we get 32-bit video chips tuned for the local bus. . . .

OBJECTVISION from Borland International: Hey, Philippe, we're still not sure where the object is in *Object-Vision*. But upcoming Version 2.0 looks superhot.

SHARP 6700: A sub-5-pound, 20-MHz SX notebook-size laptop with a built-in trackball.

STANFORD GRAPHICS: Superior scientific and technical graphics software with enough bells and whistles to excite business users, too.

Apple. It's too early to tell if and how well Taligent will run DOS and Mac applications. But who knows whether IBM's commitment to Taligent is sincere? IBM buys and stockpiles operating systems the way a bigamist stockpiles spouses.

Don't forget also: Digital Research with DR DOS 6.0, the applications-starved *Geo-Works Ensemble*, Hewlett-Packard's *HP NewWave*, and a pair of slate/tablet operating environments, GO Corp.'s PenPoint and Microsoft Windows for Pen Computing. The best features of *HP NewWave* are likely to be built into future versions of Windows, proving once again that Microsoft is great at saying one thing ("NewWave? Agents? Who needs it?") and doing another ("Say, let's cross-license your technology"). PenPoint represents astounding technical prowess, but only in fairy tales does the best product always win and live happily ever after. More than a few industry insiders see PenPoint, then

shake their heads and say privately, "What a great product! Too bad they're not going to make it."

THE BEST OF 1991: CRITERIA

Because *PC Magazine* is about products first and foremost, our look at the past year and the year ahead includes our annual list of Editors' Personal Best products. On the following pages, *PC Magazine's* editors and frequent contributors describe 29 products that represent the year's best products. This article also includes a list of honorable mentions.

Here's how we picked the Editors' Personal Best products: *PC Magazine's* editors and frequent contributors conducted a wide-ranging electronic-mail discussion that spanned one month and several hundred products. We pored over product discussions on PC MagNet and other CompuServe forums. We went back over this past year's reviews and the Editors' Choice recipients. We investigated Editors' Choice honorable men-

LOGICAL PRINTER SHARING

Justification

If one user prints 40 pages a day on an 8 page per minute laser printer, that printer will be in use for only 5 minutes per day! Logical Connections allow several users to easily share expensive printers and other resources, like modems and plotters. Choose the peripheral that you need from a pop-up menu.

If your company has a LAN, use Logical Connections for local printer sharing in smaller workgroups, rather than printing centrally through the LAN. Local printing is more convenient and more secure!

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- **FCC Class B Certification**
(FCC Class A – LC Jr. with unshielded cables)
- **Available from Local Dealers**
- **Fast Data Input and Throughput**
- **Socketed DRAM Upgrades to 1Mb**
- **Largest Selling PSDs in the USA**

Versatility **LC Plus – 512Kb \$595**

All six ports of the Logical Connection Plus are automatically configured as parallel or serial, and input or output. Installation is a breeze. You just plug in your cables and run the installation software; the LC Plus will do the rest. Besides being very user friendly, the LC Plus processes data at blazing speed for any application. You can share modems and transfer files at 115,200 bps.

6 PCs or Printers/Any Combination



Practicality **LC – 256Kb \$395**

The original Logical Connection is still all the printer sharing device that most people need. The LC is ideal for printing of word processing and occasional graphics data. Its eight ports are: four bi-directional serial ports which can be set as input or output, two parallel inputs and two parallel outputs. Six users can share two parallel printers. The serial ports can also share modems.

6 PCs to 2 Printers (Typical)



Simplicity **LC Jr. – 256Kb \$239**

Inexpensive modular cable, even hundreds of feet in length, can be used to serially connect up to four PCs to the Logical Connection Jr. at speeds up to 115,200 bps. Plug your existing parallel printer cable into the LC Jr. and it will automatically convert the data from serial to parallel for fast parallel printing. Multiple users can send data simultaneously since the memory will buffer and queue jobs on a first-in-first-out basis.

4 PCs to 1 Printer



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Customer Support:
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YOUR DISK
CAPACITY



1991
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Stacker 7.1
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Used to be, when your hard disk got full you had to empty your wallet and buy a bigger one.

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Installation, by the way, is a snap. Just plug the board into any slot—no jumpers or switches to set.

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To find just how much Stacker can do for your disk, your data and your wallet, call 1-800-522-7822 Ext. 726. Or ask your dealer for a demonstration.

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Stacker works behind the scenes, expanding your data when you need it and compressing it again as it goes back to disk.

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It doesn't even matter what kind of software you use. Because Stacker is 100% compatible with everything from business and graphics programs to undelete utilities and low-level formatters.

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In addition to the software-only version, Stacker is now available in three co-processor-with-software versions: Stacker XT/8, Stacker AT/16 and Stacker MC/16, each featuring the unique Stacker LZS chip.



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NOW FOR \$1249 you can own the only color portrait display for the PC. Introducing the Radius Full Page Pivot, the display that shows you an entire page at one time. Pivot displays 65% more information than standard 12" or 13" monitors, so you can see a letter or full page layout from top to bottom. Image quality is superb—anywhere from



VGA resolution all the way up to 1024 x 768. ● You can also rotate Pivot into landscape mode to view a complete spreadsheet.



Pivot combines with the advanced Radius SVGA MultiView Interface for real-time pivoting. When given a gentle turn, Pivot automatically reorganizes your application, so you can quickly and gracefully go from one orientation to the other.

● In addition, Pivot with MultiView provides 100% VGA and SVGA compatibility, offers high resolu-



TURN IT INTO A SPREADSHEET DISPLAY FOR FREE.

tion full-page drivers for Windows 3.0, WordPerfect, Lotus 1-2-3, AutoCAD and others, displays up to 32,768 colors and meets the Swedish standards for low ELF/VLF magnetic emissions. We might also mention that MultiView—the fastest SVGA card you can buy today—works with a variety of multi-frequency displays, sells for \$449 and comes with a seven-year warranty.



● If the combination of Full Page Pivot and SVGA MultiView sounds like the perfect display system for all your applications, it's probably because it is. Pivot and MultiView are available from Radius, the leading manufacturer of high resolution graphics systems for personal computers. To find your nearby Radius reseller or to receive a Full Page Pivot video tape, call 1-800-227-2795.



radius

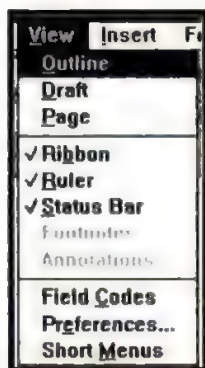
CIRCLE 234 ON READER SERVICE CARD

WHY WE HATE WINDOWS

Actually, we love Windows. But we hate what Windows and Windows apps put us through. Our biggest problem with Windows (other than the UAEs): It's a one-size-fits-all solution that desperately needs separate paths and options for skilled and less skilled users. Here are half a dozen examples of what annoys us most about Windows and Windows apps.—BH



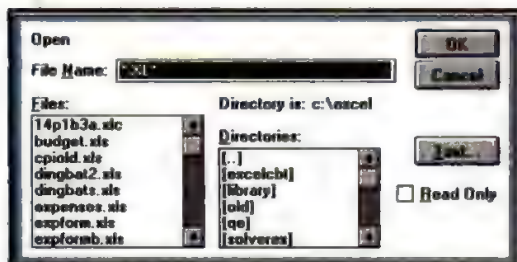
When Windows presents you with an Unrecoverable Application Error (UAE), why does the button say "OK"? It's not OK.



Adding or removing the Ribbon, Ruler and Status Bar in Word for Windows requires you to pull down the View menu three separate times, with six separate mouse movements and six separate mouse clicks. Wouldn't it be nice if Microsoft offered you a sticky menu that stayed in place so you could make all the changes at once?

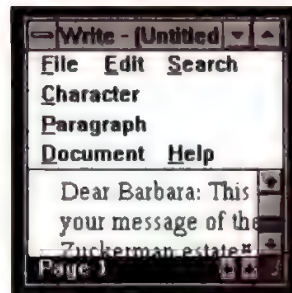


Don't you just love those self-important programs that create their own Program Groups without asking?



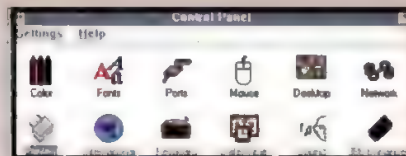
There are more than 50 Microsoft Excel files in this directory. Excel's file-open

box shows you just eight files at a time. No file size. No file date. No file time. No file-sorting options.



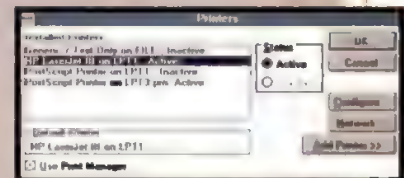
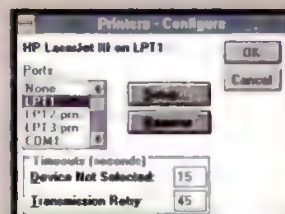
As you resize a window, your workspace gets smaller. But everything else stays the same size—to the point where the title, scroll, and menu bars take up more real estate than your data. How about an option that removes the scroll and menu bars once an app gets smaller than a quarter of a screen?

To keep from confusing the poor dumb user with too many choices all at once, Windows forces you to go through agonizing layers of dialog boxes. Suppose you want to change the number of printed copies you make. You simply...

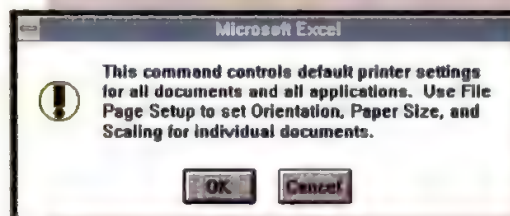


1. Call the Program Manager. 2. Click on the Control Panel. 3. Click on Printers.

4. Choose Configure.

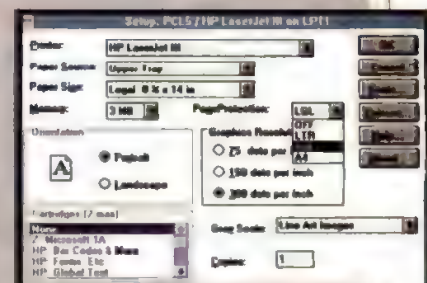


5. Choose Setup. (At this point, some apps chattily interpose a description of what lies at the next level, and make you click OK. Arrrrh!)



6. Finally, you get to choose how many copies you want to make. Note that if you were to choose Copies the quick way (Alt-File, Print), you'd get them the slow way, because Windows reimages

each copy of each page from scratch, and turns your 8-page-per-minute laser printer into a 1-ppm printer.



THE BEST OF 1991 COVER STORY

tions to see if anyone's new versions had toppled the older standards. In every instance, we asked: "Is this a superior product? Does it provide real usefulness to users? Would you buy this with your own money?" In a few cases, we considered groups of products that constitute a best-of standard, such as the collective group of drawing and design packages that are pulling the PC into parity with the Macintosh. Finally, from a group of 50-plus finalists, we chose 29 products (and in a few cases, standards) as our focus. The

final selection committee included publishing director Bill Machrone, editor-in-chief Michael J. Miller, editor Joel Dreyfuss, executive editors Bill Howard and Gus Venditto, PC Magazine Labs director James Galley III, and workgroup sys-

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tems editor Frank J. Derfler, Jr. Writing assignments were given to the editors who have the most hands-on experience in using the winning products. The individual reviews are bylined because the products are *personal* bests as much as they are *PC Magazine's* best selections.

To be eligible for consideration, a product had to be new or substantially upgraded within the past year. We did not reselect products that had received Editors' Personal Best status in a previous year but haven't been significantly

improved since that time. We did include a list of all the winners and finalists of the 8th Annual Awards for Technical Excellence (the 1991 winners), covered in greater depth in the previous issue (December 31, 1991).

Give Us Your Toughest Peripheral Sharing Problem

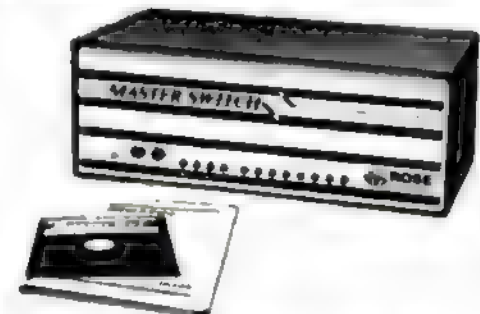
...or your simplest! Master Switch, the intelligent data switch from Rose Electronics, can handle it. The Master Switch series is so versatile and sophisticated, peripheral sharing becomes easy.

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Sony	CON-535	Internal	\$795.90	\$395.95
	CON-7201	External	\$949.90	\$449.95
Hitachi	CDR-3600PC	Internal	\$865.00	\$465.05
	CDR-1700SPC	External	\$995.00	\$495.05
Toshiba	TXM3301-B5P4	Internal	\$749.00	\$349.05
	TXM3301-E1P1	External	\$949.00	\$449.05
NEC	CDR-83 XT	Internal	\$999.00	\$599.05
	CDR-73 XT	External	\$1099.00	\$599.05
	CDR-36 XT	Portable	\$798.00	\$398.05

Footnote: Sony PCD-100, PCD-101, PCD-102, Hitachi CDR-3600PC, CDR-1700SPC, Toshiba TXM3301-B5P4, TXM3301-E1P1, NEC CDR-83 XT, CDR-73 XT, CDR-36 XT are priced directly from manufacturer as of 4/23/92. All other models are the equivalent when priced at the same time without order.

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ALDUS PAGEMAKER 4.0 FOR WINDOWS

BY LUISA SIMONE ■ I've always been a fan of *Aldus PageMaker*, but the release of *Aldus PageMaker 4.0 for Windows* (\$795) has turned me into a certifiable fanatic. An unembellished laundry list of the new features is impressive all by itself. *PageMaker* can link individual files as a book, generate a Table of Contents automatically, index multichapter publications, anchor pictures to type, import 24-bit color images, and edit text in a separate word processing window.

These new functions aren't meant to match the feature set of *Ventura Publisher* (which still has more power tools for long documents) or *Quark XPress* for the Macintosh (which can still resolve type in finer increments). Instead, *PageMaker 4.0 for Windows* gives you the best subset of both these programs' functions and makes them easier to use.

The real genius of this upgrade is in the details. What at first seem like minor typographic enhancements soon become powerful formatting tools. The ability to define timesteps that include rules or that electronically alter the width of a font can enhance documents with distinctive—and automated—design elements. Likewise, the new links to external source files may not sound like a revolutionary feature, but the auto-update function allows you to revise publications by merely opening and printing the document.

Aside from these praiseworthy features, though, *PageMaker 4.0 for Windows* remains a favorite product for one prime reason: It is robust and stable. You can stuff *Aldus Page-*

Many of *PageMaker's* new features, such as automatic table of contents generation and in-line rules, are easily invoked options.

Maker 4.0 for Windows onto an overcrowded hard disk with a host of other applications and throw an amazing array of file formats at it, and it will always work.

FACT FILE *Aldus PageMaker 4.0 for Windows*; Aldus Corp., 411 First Ave. South, Seattle, WA 98104-2871; 206-622-5500 (upgrades, 800-243-2320). **List Price:** \$795; upgrade, \$150. **Requires:** 2MB RAM, 20MB hard disk, Microsoft Windows 3.0. **Reviewed:** September 24, 1991, page 371.

CIRCLE 417 ON READER SERVICE CARD

ARTISOFT INC.

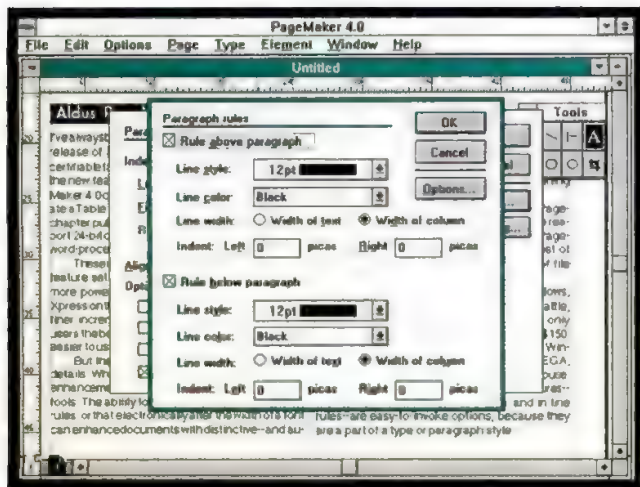
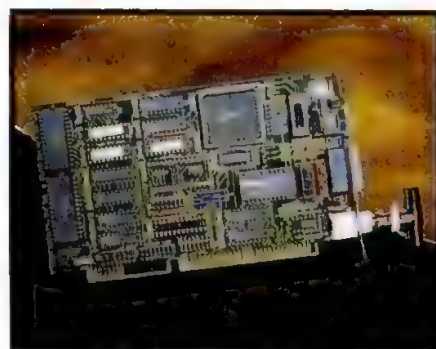
ARTISOFT AE-3 ETHERNET

BY FRANK J. DERFLER, JR. ■ PC networks have mongrel blood. LAN administrators must integrate PCs with a variety of drivers into different network wiring schemes and LAN operating systems. Our Ethernet adapter of choice is the Artisoft AE-3 Ethernet. The \$349 AE-3 comes with an AUI connector, a BNC connector, and a 10BaseT connector on-board, so it's ready to slip into any type of Ethernet network. The adapter card provides an excellent implementation of NetBIOS, and because it is an electrical clone of the Novell NE-2000 board, the many IPX, NDIS, IP, and other drivers designed for the NE-2000 work just fine on the AE-3.

The AE-3 also features an in-socket reprogrammable boot ROM. If you want to change or upgrade operating systems, you simply execute a program to load the new code onto the ROM. Artisoft makes updates available through its electronic bulletin board system and through dealers. You can load the EPROM with a security program that forces the user to type in a name and password before the system will boot up. This makes it easy to secure all diskless and disk-equipped PCs on a network.

The standard 16K RAM buffer, upgradable to 64K, moves data fast off busy networks, and the adapter offers eight IRQ addresses, so you can find a way to install it in a crowded PC. The AE-3's major benefit is that it will work with a wide variety

The Artisoft AE-3 Ethernet adapter can work in a wide variety of PCs and Ethernet networks.



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BEST BUY
AWARDS



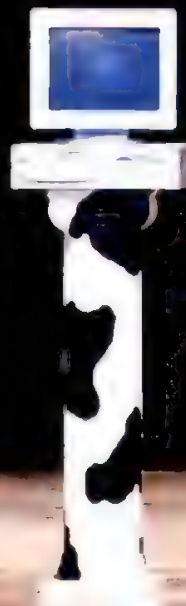
GATEWAY2000

"You've got a friend in the business."

GATEWAY 2000 =



386 SX Systems
GATEWAY 2000 386 SX/20C



"What's most meaningful about these awards," said Gateway 2000 President Ted Waitt, "is they are given by the readers of

15,000 people cast over 100,000 votes for products in 27 hardware and software categories. The vote on desktop PCs was a

OUR • FABULOUS COMPUTERS • MORE • SAVVY PC USERS • YOU KNOW

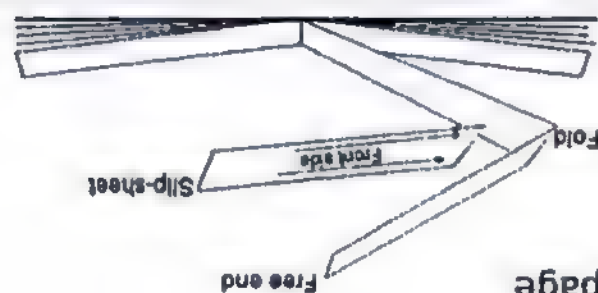
Computer Shopper, people who are buying and using PCs in the real world."

decisive victory for the Midwestern firm customers call the "cow company."

Shopper readers voted in record numbers:

According to *Computer Shopper*, the Best

tees from departments throughout the company.



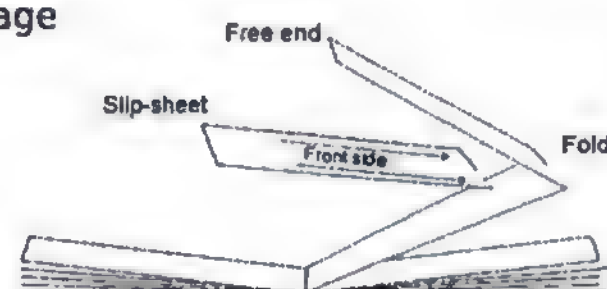
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Inverted Foldout slip-sheet



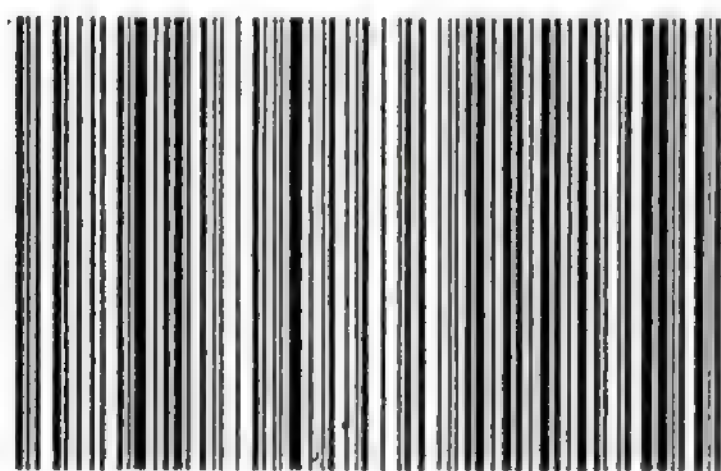
Foldout slip-sheet

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 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-001B

Back

1. Follow instructions on the other side



286 Systems
GATEWAY 2000 286/16



For the first time in the six-year history of *Computer Shopper* magazine's Best Buy competition, one company swept all of the awards in the desktop PC categories. At COMDEX/Fall '91 in Las Vegas, Gateway 2000 was awarded Best Buy honors for 286, 386SX, 386 and 486 desktop computer systems.

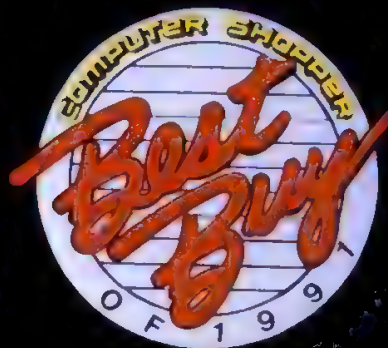
Our thanks to Gateway's own Semi-Gold Dancers played by emplo

AND THE



WINNER IS...





486 Systems
GATEWAY 2000 486/33



Gateway's the one with the award-winning service organization that'll take good care of your system. Gateway's the one that's going to be here for you. And Gateway's the only one with a great PC that comes in a cow-shaped box suitable for use as a rec room end table or TV stand.

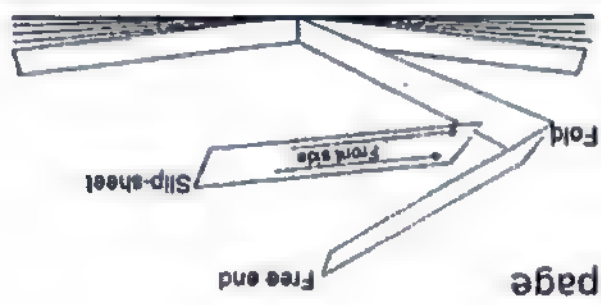
Call a Gateway 2000 sales representative

today for all the details on the Best Buy system we'll build just for you.



"You've got a friend in the business."

8 0 0 - 5 2 3 - 2 0 0 0



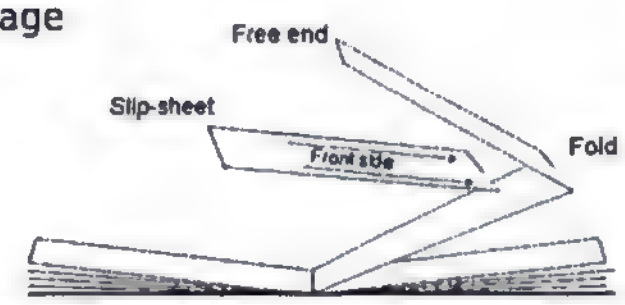
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4. Close the page and slip-sheet

Inverted Foldout slip-sheet



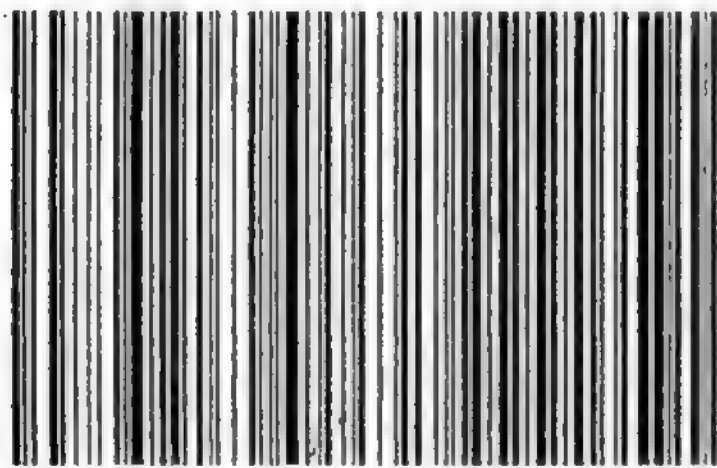
Foldout slip-sheet

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 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lipBack-0018

Back

1. Follow instructions on the other side

IT'S A CLEAN SWEEP



386 Systems
GATEWAY 2000 386/33C



Buy Awards have come to symbolize the best in service, quality, performance, support and product selection. This combination gives you

sells more computers through the direct channel than any other PC manufacturer. This in itself is testament to the value Gateway 2000 offers.

WHAT COMPANY GIVES YOU THE BEST VALUE • GATEWAY'S THE ONE
the best value on the market. One look and you'll be convinced, too.

It's really no surprise Gateway 2000 systems were singled out as Best Buys since Gateway

One look and you'll be convinced, too.

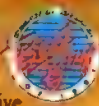
Gateway's the one with the best prices on quality, fully-loaded, high-performance systems.

THE LINE THAT SWEEP 'EM AWAY

16 MHZ 286

80286 Processor
2MB RAM
1.2MB 5.25" Drive
1.44MB 3.5" Drive
40MB 17ms IDE Drive
with 32K Cache
16-Bit VGA with 512K
14" Crystal Scan 1024
Color VGA Monitor
1 Parallel/2 Serial Ports
1 PS/2 Mouse Port
124-Key AnyKey™ Keyboard
MS DOS® 5.0

\$1345



16 MHZ 386SX

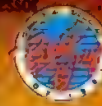
Intel® 80386SX Processor
2MB RAM
1.2MB 5.25" Drive
1.44MB 3.5" Drive
40MB 17ms IDE Drive
with 32K Cache
16-Bit VGA with 512K
14" Crystal Scan 1024
Color VGA Monitor
1 Parallel/2 Serial Ports
1 PS/2 Mouse Port
124-Key AnyKey Keyboard
Microsoft® Mouse
MS DOS 5.0
MS Windows™ 3.0

\$1445

20 MHZ 386SX

Intel 80386SX Processor
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1.44MB 3.5" Drive
80MB 17ms IDE Drive
with 32K Cache
16-Bit VGA with 512K
14" Crystal Scan 1024
Color VGA Monitor
1 Parallel/2 Serial Ports
1 PS/2 Mouse Port
124-Key AnyKey Keyboard
Microsoft Mouse
MS DOS 5.0
MS Windows 3.0

\$1745



25 MHZ 386

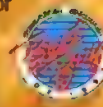
Intel 80386SX Processor
4MB RAM
1.2MB 5.25" Drive
1.44MB 3.5" Drive
80MB 17ms IDE Drive
with 32K Cache
16-Bit VGA with 1MB
14" Crystal Scan 1024NI
Color VGA Monitor
1 Parallel/2 Serial Ports
124-Key AnyKey Keyboard
Microsoft Mouse
MS DOS 5.0
MS Windows 3.0

\$1895

33 MHZ 386

Intel 80386 Processor
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4MB RAM
1.2MB 5.25" Drive
1.44MB 3.5" Drive
200MB 15ms IDE Drive with
64K Multi-Segmented Cache
16-Bit VGA with 1MB
14" Crystal Scan 1024NI
Color VGA Monitor
1 Parallel/2 Serial Ports
124-Key AnyKey Keyboard
Microsoft Mouse
MS DOS 5.0
MS Windows 3.0

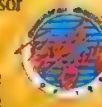
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33 MHZ 486

Intel 80486 Processor
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1.2MB 5.25" Drive
1.44MB 3.5" Drive
200MB 15ms IDE Drive with
64K Multi-Segmented Cache
16-Bit VGA with 1MB
14" Crystal Scan 1024NI
Color VGA Monitor
1 Parallel/2 Serial Ports
124-Key AnyKey Keyboard
Microsoft Mouse
MS DOS 5.0
MS Windows 3.0

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33 MHZ 486 EISA

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1.44MB 3.5" Drive
340MB 15ms SCSI Drive with
128K Multi-Segmented Cache
32-Bit EISA SCSI Controller
16-Bit VGA with 1MB
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BEST BUYS

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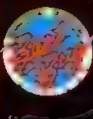
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GLOBAL RECYCLE

of PCs despite different BIOS versions, VGA ROM sets, and data-bus DMA timing quirks.

FACT FILE **Artisoft AE-3 Ethernet**; Artisoft Inc., Artisoft Plaza, 575 E. River Rd., Tucson, AZ 85704; 602-293-6363. **List Price:** \$349. **Requires:** Ethernet network. **Reviewed:** Not previously reviewed in *PC Magazine*.
CIRCLE 418 ON READER SERVICE CARD

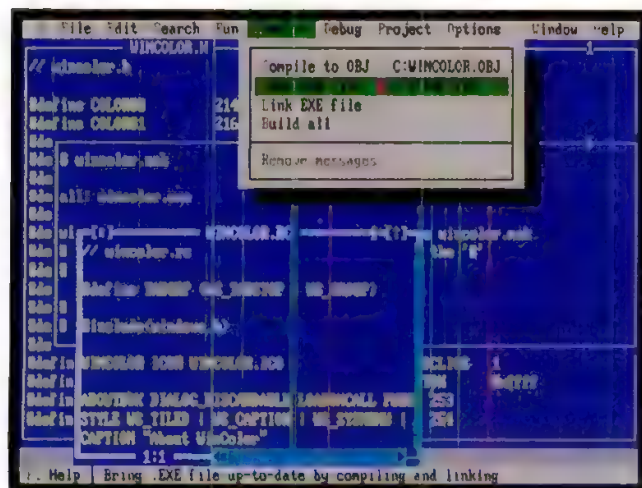
BORLAND C++ 2.0

BY RICHARD HALE SHAW ■ Before 1991, C programmers had one solution for Microsoft Windows programming: Buy a slow C compiler and an incomprehensible Windows software development kit. However, Borland C++ 2.0 offers blinding compilation speed, the convenience and power of C++, a powerful (and usable!) debugger, and an integrated development environment (IDE) that keeps getting better. There's only one stipulation: The SDK is not required.

Borland C++'s protected-mode compiler is a full ANSI C compiler and is compatible with AT&T Computer Systems' C++ 2.0 standard. Precompiled headers make it faster than its predecessor, Turbo C++ Professional, a 1990 *PC Magazine* Technical Excellence winner. Coupled with the *ObjectWindows* application framework (included with full source code), C++ can be used to build Windows apps quickly and easily. This has spurred competitors like Zortech into adding 16- and 32-bit extenders and C code generators, but not the comprehensive Windows class libraries found in *ObjectWindows*.

You won't miss the SDK; the

Borland C++ offers a powerful environment for developing Windows applications, like this coloring program.



Whitewater Resource Toolkit gives you complete control over resources, and its documentation features the SDK reference, on-line and on paper. And you won't be trapped by Windows' programming pitfalls, such as forgetting to export a callback function; Borland C++ can do this automatically. The IDE now offers history and pick lists, as well as dialog selection of application targets—and don't forget the best Windows debugger, Turbo Debugger, a 1988 Technical Excellence award winner.

Borland C++ 2.0 is a requirement for every professional Windows programmer.

FACT FILE **Borland C++ 2.0**; Borland International, 1800 Green Hills Rd., Scotts Valley, CA 95067-0001; 408-438-8400. **List Price:** \$595; with Application Frameworks, \$695. **Requires:** 512K RAM for IDE, 3MB RAM for Microsoft Windows programming, 15MB hard disk space, DOS 3.0 or later, Microsoft Windows 3.0 or later. **Reviewed:** April 30, 1991, page 42.

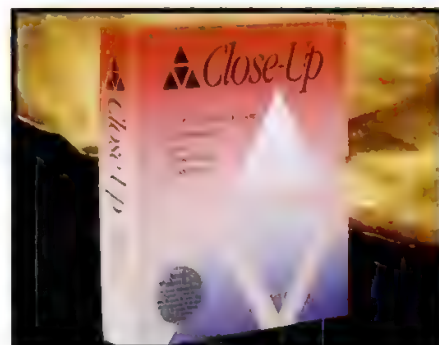
CIRCLE 419 ON READER SERVICE CARD

CLOSE-UP, VERSION 4.0

BY STEVE RIGNEY ■ *Close-Up* was one of the first remote-control communications programs on the market. It's been highly polished, and its flexibility and capability clearly make it the best program you can buy for remote control.

The emphasis on graphics in modern applications presents a challenge to modern remote-control programs. You can dial in and access your office PC and LAN with these programs, but when transmitting graphics screens they typically stutter and grind because of the quantity of data they are asked to move. The programmers at Norton-Lambert Corp. who wrote *Close-Up*, Version 4.0, have developed a method of video data compression that is equally effective with Microsoft Windows displays and DOS graphics-mode screens. The host side of the program, known as Customer/Terminal, sells for \$195,

***Close-Up* provides speedy remote control over character-based, graphics, and Microsoft Windows applications.**



while the remote side, *Close-Up Support/ACS*, costs \$245.

You don't have to buy special versions of the *Close-Up* package for DOS and Windows: It supports any programs in any environment where DOS applications can run. *Close-Up* provides fast file transfers, low memory requirements, virus protection, several types of security, and good remote control for mouse operations.

Any type of memory manager can tuck the program away in high memory, giving the remotely controlled machine plenty of room to run applications. Support of COM ports 1 to 8 makes it easy to set up *Close-Up* in a multitasking access server without loading special drivers for multiport communications boards.

FACTFILE *Close-Up, Version 4.0*; Norton-Lambert Corp., P.O. Box 4085, Santa Barbara, CA 93140; 805-964-6767. **List Price:** *Close-Up Support/ACS*, \$245; *Customer/Terminal*, \$195; *Dual Pak*, \$199. **Requires:** 34K RAM on host, 153K on remote PC, two modems, DOS 2.0 or later. Microsoft Windows 3.0 or later optional. **Reviewed:** October 15, 1991, page 46.

CIRCLE 420 ON READER SERVICE CARD

DECHUB 90

BY FRANK J. DERFLER, JR. ■ Any facility manager sees people and organizations as fluid bodies always in motion. Wiring plans often don't mesh with the reality of where people sit and the floor space coveted by different departments. Designers at Digital Equipment Corp. have combined innovative and practical packaging with conformance to

The DEChub 90 and its associated modules supply a network wiring concentrator system made of snap-together components.

standards to deliver an Ethernet wiring concentrator system with great flexibility. The Digital system uses plastic cased modules that look like VHS videocassette boxes gone hi-tech. These modules snap into an

\$890 DEChub 90 backplane that provides power and data connections. You can, in turn, fit this unit into Digital's \$490 DEHUX case to create a miniature equipment closet. The

costs for this system are lower than for similar rack-mounted alternatives, and the ability to move, mix, and match modules is very high.

Digital sells two different DECRepeater modules to fit into the DEChub, which are priced at \$1,540 each. The thin Ethernet repeater allows you to use the more reliable star topology for thin coaxial cables. Every Ethernet UTP network needs a wiring center, and the other repeater, for unshielded twisted-pair cable (10BaseT), helps you set one up. Digital also offers DECbridge modules for \$2,840 to segment the LAN and control traffic. A management control module for the popular Simple Network Management Protocol (SNMP) is also reportedly in the works.

The DEChub system and its associated products bring a unique flexibility to any Ethernet wiring system using LAN adapters and LAN software from any companies. Digital has fielded an innovative product with appeal for any network or facility manager.

FACT FILE *DEChub 90*; Digital Equipment Corp., 146 Main St., Maynard, MA 01754-2571; 508-493-5111. **List Price:** DEChub 90, \$890; DEHUX cover assembly, \$490; DECserver 90L, \$1,275 (standalone version, \$1,450); DECbridge 90, \$2,840 (standalone version, \$2,890); DECRepeater 90T (twisted-pair) or 90C (coaxial), \$1,540 (standalone version, \$1,590). **Requires:** Ethernet network, twisted-pair or coaxial wiring. **Reviewed:** Not previously reviewed in *PC Magazine*.

CIRCLE 421 ON READER SERVICE CARD

DIGITAL PALETTE CI-3000

BY ALFRED POOR ■ When you're in the market for new computer products, you usually have to settle for one or two of the following qualities: a low price, top-quality performance, loads of extras, easy installation, and simple operation. With Polaroid's \$4,495 Digital Palette CI-3000 film recorder, you get all of them.

Unlike its competitors (which generally cost between \$2,000 and \$4,000 more), the CI-3000 won't make you struggle with expansion boards and arcane configuration settings. Just hook it up to a parallel port and you're ready to make slides from your business presentation graphics programs. The unit works directly with Ashton-Tate Corp.'s *Applause II*, Software Publishing Corp.'s *Harvard Graphics 3.0*, Lotus Development Corp.'s *Freelance Graphics for OS/2*, Business & Professional Software's *Presentation Express* and *35mm Express*, and Advanced Graphics Software's *SlideWrite Plus*. It also comes

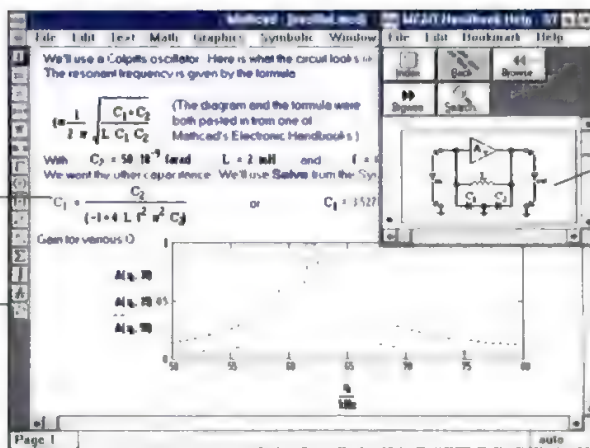


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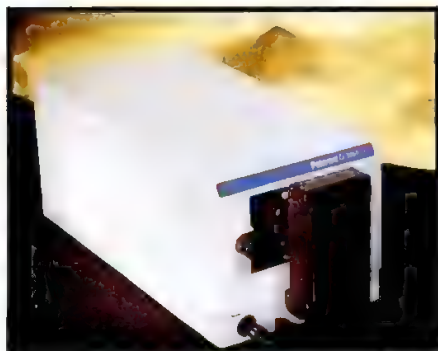
MathSoft, Inc.
201 Broadway, Cambridge, MA 02139 USA



Mathcad 2.5
3-14-89 issue.
Best of '88
Best of '87



with an imaging utility for CGM, TIFF, and Targa files, and you can purchase optional utilities to support SCODL, .PCX, .GIF, and Microsoft Windows 3.0 .BMP formats.



Polaroid's Digital Palette CI-3000 film recorder produces professional-quality slides for presentation graphics programs.

The parallel port is a bit slower than custom interfaces, but it adds only a tolerable minute or so per slide. The unit offers only 2,000-line resolution, but on our tests it outperformed the more expensive 4,000-line competition in terms of image quality. The CI-3000 also supports 33-bit color, which helps it produce smoother gradient fills, and its 3-inch-diagonal CRT helps make crisp pictures. The unit also includes two standard camera backs (giving you a wide choice of films), a print utility, a film processor, a mounter, and a cutter.

Not everyone needs to make slides. But if you rely on pictures for your presentations and want professional-quality images at a moment's notice, take notice of Polaroid's Digital Palette CI-3000.

FACT FILE **Digital Palette CI-3000;** Polaroid Corp., 575 Technology Square, Cambridge, MA 02139; 800-225-1618, 617-577-2000. **List Price:** \$4,495. **Requires:** 286-based PC or better, 640K RAM (2MB recommended), DOS 3.0 or later.

Reviewed: May 14, 1991, page 328.

CIRCLE 540 ON READER SERVICE CARD

HEWLETT-PACKARD CO.

HP LASERJET IIIP

BY EDWARD MENDELSON ■ Hewlett-Packard Co. isn't worried that its LaserJet III printer suddenly has to share the title of Most Valuable Laser with an upstart. That's because the new rival is its own HP LaserJet IIIP. The \$1,595 LaserJet IIIP occupies half the desktop space of the pricier LaserJet III (listed at \$2,395) and offers the same Resolution Enhancement Technology for impressively sharp text and line drawings at 300 dots per inch, plus the same scalable fonts and HP PCL 5 compatibility. The LaserJet IIIP's street price ranges from \$900 to \$1,100, compared with LaserJet III's \$1,450 to \$1,575. It prints

text at 4 pages per minute, which is half the speed of the LaserJet III, but both print at the same 4-ppm rate if you plug in a PostScript cartridge. And the LaserJet IIIP's parallel port pulls data from your computer more quickly.

If you buy the optional \$195 lower tray, the LaserJet IIIP offers even better paper handling than the LaserJet III, with easy access to letterhead in the internal tray and second sheets in the lower tray. And the LaserJet IIIP's newer Canon LX engine provides slightly but unmistakably darker and clearer



print than the older SX engine in the LaserJet III.

Your only reasons to buy the LaserJet III are greater speed, two font cartridge slots instead of the LaserJet IIIP's one slot, and the ability to accept add-in cards like the LaserMaster board. Speed is the most compelling reason, but it's easily balanced by the LaserJet IIIP's low price, small footprint, and superb quality. Maybe you should buy one of each.

The HP LaserJet IIIP printer gives you superb-quality output at a bargain price and won't use much desktop space.

FACT FILE **HP LaserJet IIIP;** Hewlett-Packard Co., 19310 Pruneridge Ave., Cupertino, CA 95014; 800-752-0900. **List Price:** \$1,595. **Reviewed:** November 26, 1991, page 192.

CIRCLE 422 ON READER SERVICE CARD

HEWLETT-PACKARD CO.

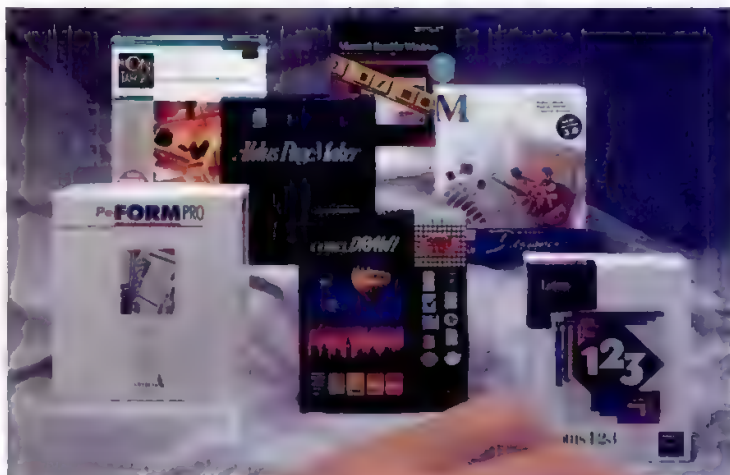
HP LASERJET IIISI

BY MARY KATHLEEN FLYNN ■ Shared laser printers held one of the hottest tickets in town this year. Hewlett-Packard Co. made the first bid when it brought out the 17-page-per-minute \$5,495 HP LaserJet IIISI last spring. By August, nine other vendors had followed suit. But HP won the hand—as well as an Editors'

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CIRCLE 250 ON READER SERVICE CARD

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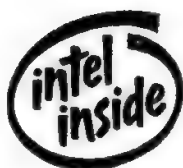
it's *three* of the best personal
computers you can buy.

■ *First, the UltraLite III, when it's a note-
book*, weighs just 4.8 pounds and
measures a super-thin 1.5" x 9" x 11.5"

It has 2MB of RAM (expandable to
10MB), a crisp, bright VGA screen,
60MB hard drive and 386SX processor
running at 20 MHz. It also has a broad
range of connectivity features, including



At 4.8 pounds, it's one of the smallest, lightest 386SX notebooks around.



C&C
Computers and Communications

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serial and parallel ports, a Super VGA CRT port, a mouse port, and an optional internal modem or fax modem. Not to mention an optional external battery slice for a total of over five hours of power. All of which permits it to perform feats far beyond the reach of ordinary notebooks, far from home.

■ *Second, when it's a desktop*, it is a very high-performance machine indeed, delivering full desktop capacity. Nestled in its optional docking station, the UltraLite III gives you even more computing power. It can accept up to two AT[®] cards, and its standard 5¼" drive bay can house a hard or floppy drive, CD-ROM reader, tape backup or other storage device. Allowing you to build the exact computer system you need.

■ *Third, when it's a portable PC*, it's about as portable as you can get. Combined with its docking station, it weighs under 15 pounds and is comparable in size to most laptops. So you can set up your office whenever and wherever you need it.

The UltraLite III comes ready to run with MS-DOS[®] 5.0 and Windows[®] pre-installed. It also gives you something you can't get from anyone else, at any price: NEC. Fact is, NEC not only invented the notebook PC, we invented the docking station, as well.

For more information, call 1-800-NEC-INFO. Or call NEC FastFacts 1-800-366-0476, #ULITE3 (854833) for literature. The new UltraLite III. The answer to your every computing need.



It's a powerful 386SX desktop PC.



It's a portable PC, so you can take your desktop computing anywhere.

Because  is the way you want to go.

NEC

Choice award in our eighth annual printer blockbuster.

Although it was the first of its kind, the HP LaserJet IIISi still exemplifies the standard for shared-environment printing. It provides considerable speed: 15 ppm on PC Magazine Labs' text speed test and almost 4 graphics pages per minute on the graphics speed test, making it the fastest HP PCL graphics printer in our latest roundup. With all of its features installed, including two 500-sheet input cassettes (which will take over for each other if one runs out), a new Canon engine rated for 50,000 pages per month, a \$695 duplexing module, an \$895 Token-Ring adapter or a \$695 Ethernet connection, and an \$895 Adobe PostScript upgrade (though you'll need to install 2MB to 4MB extra, for a total cost between \$1,100 and \$1,400), the LaserJet IIISi runs between \$7,949 and \$8,479. At



that price, it is a solid alternative to multiple personal page printers.

Though you won't get B-size printing or automatic emulation sensing (unless you turn to third-party vendors), the LaserJet IIISi also has the standard LaserJet III family traits: HP PCL 5 and Resolution Enhancement Technology (RET) for crisp, dark output. HP has again managed to take the lead in the new shared printer product category with a fast, competent, and cost-efficient LaserJet.

The HP LaserJet IIISi printer, designed for network use, produces crisp, dark output.

FACT FILE **HP LaserJet IIISi**; Hewlett-Packard Co., 19310 Pruneridge Ave., Cupertino, CA 95014; 800-752-0900. **List Price:** With PCL5, 1MB RAM, \$5,495; with PostScript upgrade, 2MB RAM, \$6,595. PostScript upgrade, \$895; envelope feeder, \$495; duplex printing tray, \$695; legal-size paper tray, \$129; 1MB SIMM, \$169; 4MB SIMM, \$499; Ethernet expansion interface, \$695; Token-Ring expansion interface, \$895. **Last reviewed:** November 26, 1991, page 289.

CIRCLE 423 ON READER SERVICE CARD

HP SCANJET IIC

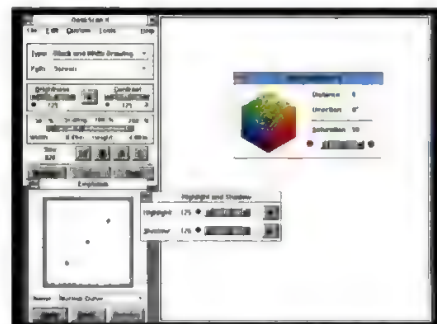
BY ALFRED POOR ■ The story of the HP ScanJet IIC is about color, or more accurately, millions of colors. The ScanJet IIC can create spot-color, 256-color, 24-bit-color, and black-and-white images quickly and easily, and it's affordable. The \$2,195 list price is the same price that Hewlett-Packard Co. charged for the gray-scale HP ScanJet Plus earlier this year, and it includes a Macintosh interface. (The ScanJet Plus's price has since been lowered to \$1,590.) The ScanJet Plus was the best gray-scale scanner in our August 1991 review, but we think that with only a \$500 price difference, you should opt for the color unit unless you know that gray-scale scanning is all you'll ever want.

The ScanJet IIC accomplishes its scan in a single pass, though it starts and stops repeatedly when scanning high-resolution images at the color settings. A pair of fluorescent lamps provides the light that will be needed for a three-stripe charge coupled device (CCD) scan head.

The scanning software is sophisticated, with automatic settings that generally produce good results. A number of extra

features let you fine-tune the settings even further, including controls for highlight and shadow, color adjustment, and emphasis. After you have your image on-disk, you can use the copy of *Publisher's Paintbrush* that is included with the package to edit the picture you've captured.

There are other color scanners in the same price league, but the combination of features, ease of use, quality output, price, and Hewlett-Packard's reputation are tough to beat. So long, black and white; hello, color!



The HP ScanJet IIC's software tools let you fine-tune its scanning parameters to give you total control.

FACT FILE **HP ScanJet IIC**; Hewlett-Packard Co., 19310 Pruneridge Ave., Cupertino, CA 95014; 800-752-0900. **List Price:** With ISA or MCA interface, \$2,195. **Requires:** 640K RAM; 4MB hard disk space; Microsoft Windows 3.0, including display and pointing device. **Reviewed:** October 15, 1991, page 35.

CIRCLE 424 ON READER SERVICE CARD

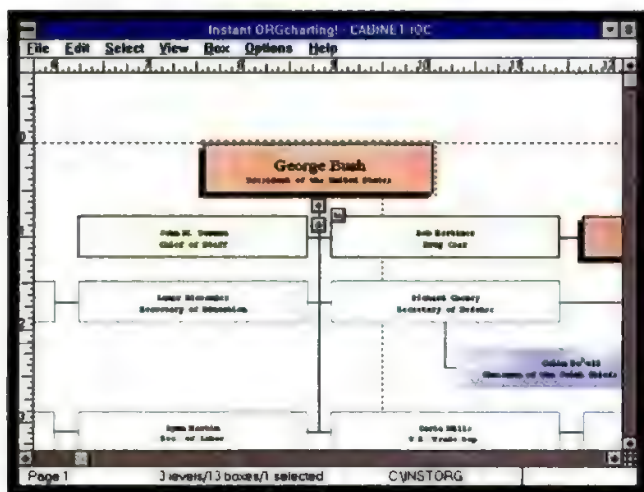
**LOOK WHAT
PC MAGAZINE
HAD TO SAY ABOUT
A VERY GRAPHIC
AND RACY
SUBJECT.**

ROYKORE INC.

INSTANT ORGCHARTING!

BY JOEL DREYFUSS ■ *Instant ORGcharting!*, from Roykore, avoids the fill-in-the-blanks metaphor that is so prevalent in Microsoft Windows software when you are tackling a tedious but unavoidable function of the modern manager: drawing up an organizational chart.

Instant ORGcharting! almost makes it fun. To create the boxes you need, you click on several small icons (actually, little gray boxes with stems pointing up, down, or sideways). Click once and the box opens for you to enter names, titles, and other data; hold the Shift key down, click several times, and you can create multiple boxes on the same level. Some fields, like



salary, can be hidden from prying eyes and suppressed in printing. You move up and down your chart by scrolling or direct selection and the appropriate icons appear to let you build your document.

It takes just a few minutes to generate a fairly complex chart. There's a smart Undo function that pops up ready to cancel the last thing you shouldn't have done. You can manually move boxes around in a finished chart for a better look, or add drop shadows, lines, and text to produce an impressive document. One useful feature is the ability to select an entire group of boxes and decide whether they should be drawn in one of several horizontal or vertical configurations.

Instant ORGcharting! has its weaknesses, though. There is no function to get the best fit on paper. You can waste a lot of trees printing a chart and ending up with overlapping sheets that have to be pasted together. But for the moment, it's the best way to get a complex organization down on paper.

***Instant ORGcharting!*'s point-and-click interface makes it easy to produce complex organizational charts.**

FACT FILE *Instant ORGcharting!*; Roykore Inc., 2215 Filbert St., San Francisco, CA 94123; 415-563-9175. **List Price:** \$195. **Requires:** 512K RAM, graphics adapter, Microsoft Windows 3.0. **Reviewed:** December 17, 1991, page 360. **CIRCLE 425 ON READER SERVICE CARD**

LHA, VERSION 2.13

BY BARRY SIMON ■ *LHA*, Version 2.13, a remarkable free utility from Japan, was the Editors' Choice winner in our roundup of compression software. Compression programs let you squeeze files together into a small format and later recover them, making them ideal for transmission by modem or for shoehorning onto floppy disks.

You can also use compression software to archive files on-disk that you'd otherwise need to move off to a backup medium. But if hard disk space is tight, you may be better served by an on-the-fly compression product like *Stacker*, a Technical Excellence winner described in our previous issue.

The compression abilities of *LHA* are impressive: Text files typically shrink by a factor of 3, while .WK1, .DBF, and some graphics files compress by a factor of 6. These figures are about 10 percent better than with *LHA*'s previous version.

LHA's attractiveness is enhanced by a tiny self-extraction module, allowing users without *LHA* to extract files from archives you send them. The module uses less than 2K of overhead and offers a customized screen.

Even if you reserve *LHA* for your personal use, you'll need to have a way to handle ZIP, the most popular compression standard on BBSs. ZIP/UNZIP capability is available not only in the original *PKZIP* but in other programs like *Magellan*.

If you need to compress files, you'll want *LHA*, Version 2.13. It's available in library 16 of PC MagNet's Utilforum as LHA213.EXE.

FACT FILE *LHA, Version 2.13*; can be downloaded from PC MagNet's Utilforum as LHA213.EXE (or later number if the version changes). **List Price:** Free. **Requires:** DOS 2.x or later. **Reviewed:** October 15, 1991, page 316. **CIRCLE 426 ON READER SERVICE CARD**

MATHSOFT INC.

MATHCAD, VERSION 3.0

BY BARRY SIMON ■ MathSoft's *Mathcad*, Version 3.0, is the mathematical scratch pad par excellence. For anything from the kind of technical problem you can solve in a few lines to a few pages of calculations, this \$495 Microsoft Windows-based

“The DECpc 433 mixes top PC performance with networking and blazingly fast video performance.”

PC Magazine
October 15, 1991



Pretty hot stuff, huh? And that's not all *PC Magazine* felt fit to print about our DECpc™ 433

Workstation. Just get a load of this: "The DECpc 433 adds value to the existing standard without sacrificing compatibility. What's more, this machine shows strength in an area where DEC knows a thing or two: the graphics workstation market."

And how about this: "At \$5,999*... [this] machine is a PC designer's dream."



Of course, far be it from us to censor one of the best PC sources in the business. Especially when it comes to this quote (our favorite): "If graphics speed is important to you, give the DECpc 433 a long hard look."

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WINDOWS
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A collection of various small, colorful objects and illustrations scattered on a white background. The items include: a green and black spotted frog in the top left; a blue biplane flying over a large yellow sun in the middle left; a blue motorcycle in the center; a red open-wheel car in the top right; a green clover in the far top right; a yellow pencil with a red eraser and a black 'S' in the bottom right; a white crown on a black square in the top right; a white horse on a black square in the middle left; a white dog on a red square in the bottom left; a white cat on a red square in the bottom center; a white face with a yellow smile in the top center; a black 'L' shape with a white '6' in the top center; a black 'L' shape in the middle right; a red square in the middle right; and a white square with a black 'S' in the bottom center.

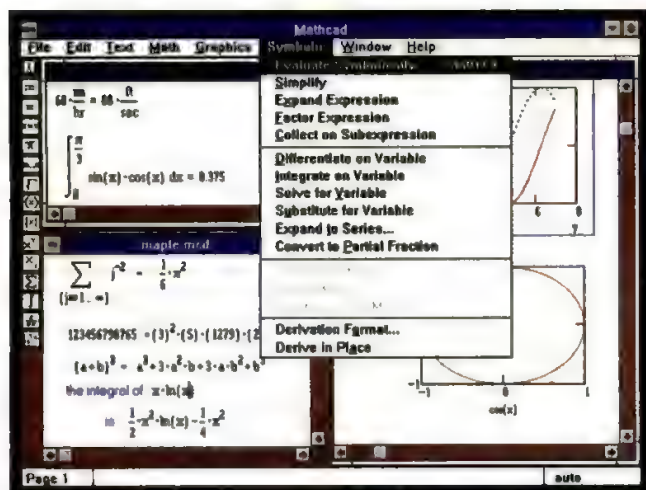
More than 2,600 ready-to-use clip art images make *Windows Draw*™ perfect for business graphics, home office projects, even presentations.

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program is a superb tool. It includes oodles of special functions, numerical integration and differentiation, algebraic equation solvers, and matrix functions.

Also new to this version are symbolic calculus and computer algebra features licensed from Maple Software. Among the symbolics are factorization of polynomials and integers and series expansions of functions of a single variable, but not multivariable or Pade approximations. Numeric differential equation solvers are available, but symbolic ones are not.

Mathcad has always been noteworthy for its WYSIWYG interface, using integral signs rather than functions with hard-to-remember arguments. *Mathcad* 3.0 illustrates that even good interfaces can be improved by using Windows. It displays a toolbar along the edge of the screen, and the report output supports all of the Windows fonts. The MDI interface allows multiple open files and provides easy cut-and-paste between them. MathSoft also uses the help engine to provide handbooks of formulas that you can directly paste into *Mathcad* itself.

For large problems that require programming, you'll want a number cruncher like *Matlab*, *Gauss*, or a symbolic powerhouse like *Maple* or *Mathematica* (whose Windows version, although not ready in time for our deadline, is likely to be a major 1992 release). But for a scratch pad, there's nothing like *Mathcad*, Version 3.0.

New in this version of *Mathcad* are an array of symbolic math functions and a Microsoft Windows graphical interface.

FACT FILE *Mathcad*, Version 3.0; MathSoft Inc., 201 Broadway, Cambridge, MA 02139; 800-628-4223, 617-577-1017. **List Price:** \$495. Educational pricing available. **Requires:** 2MB RAM, Microsoft Windows, mouse. Coprocessor recommended. **Reviewed:** September 24, 1991, page 56.

CIRCLE 427 ON READER SERVICE CARD

MEDIA VISION

PRO AUDIOSPECTRUM

BY ROBERT KENDALL ■ Although the PC's audio capabilities have historically been weak, Media Vision's Pro AudioSpectrum has broken through this limitation. The \$389 add-on board conforms to the Multimedia PC (MPC) specification and transforms your computer into a high-fidelity audio workstation.

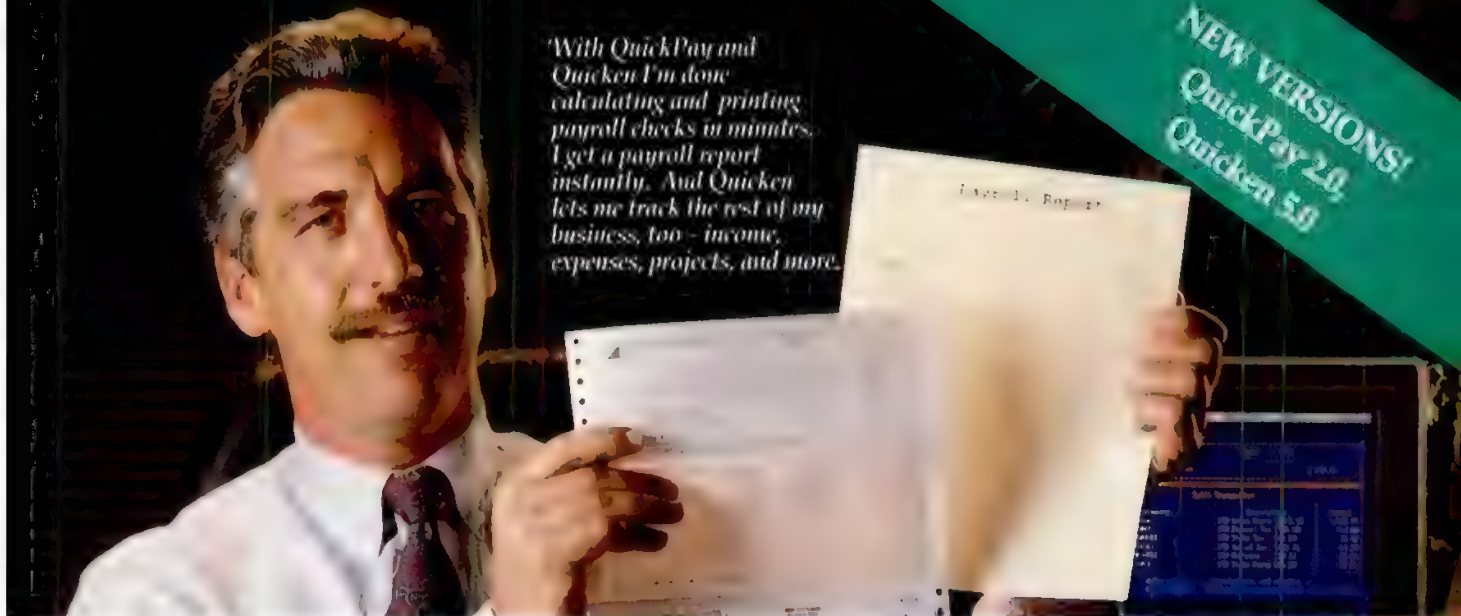
Never before have such sonic riches been within such easy reach of PC users. The Pro AudioSpectrum sports a 22-voice MIDI-compatible stereo synthesizer, as well as a sampler for recording and playing back high-quality digitized audio. You can connect a microphone and stereo sound source and run all output to a stereo amplifier. A SCSI interface even lets you hook up a CD-ROM drive to use as a CD player, while an optional MIDI connector supports MIDI keyboards.

With the software-controlled mixer, you can adjust the volumes of each sound source independently. Most impressive of all is that you can mix all sound sources and record them simultaneously as a digitized audio file. The on-board stereo sampler's 8-bit PCM (pulse code modulation) sampling at 44.1 kHz doesn't match the 16-bit sampling of studio equipment, but the final results are darn good.

While bringing the PC to new aural heights, the Pro AudioSpectrum remains compatible with synthesizers in the widely supported Sound Blaster and AdLib cards. To top it off, the board comes with a MIDI sequencer program called *Spectrum Jr.* and a proprietary collection of TSR software called *AudioMate* for adding sound to screen shows produced by *AutoDesk Animator*, *Freelance*, *HarvardGraphics*, and other programs.

The Pro AudioSpectrum's mixer software provides on-screen sliders for controlling sound source volumes.





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940 Social Sec	100.00	100.00
941 Medicare	18.75	18.75
942 FICA	10.00	10.00
943 State Tax	10.00	10.00
944 Social Sec	100.00	100.00
945 Medicare	18.75	18.75
946 FICA	10.00	10.00
947 State Tax	10.00	10.00
Total	702.45	702.45

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SPECIFICATIONS: IBM: All IBM PC, XT, AT, PS/1, PS/2, and compatibles with 512K RAM and DOS 2.11 or higher. Hard disk required. QuickPay works with IBM/DOs Quicken version 3.0 or higher. Calculates taxes for the 50 U.S. states, Washington D.C., and Puerto Rico. Quicken (but not QuickPay) is also available in Macintosh and Windows versions. Unlimited free technical support. Not copy protected.

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The Pro AudioSpectrum also comes as part of Media Vision's \$995 internal MPC upgrade kit, which includes a Sony CD-ROM drive with all necessary cables and drivers, Multimedia Extensions for Windows (free to present owners of the ProAudio Spectrum until December 31, 1991), and two free CD-ROM applications: *Compton's MultiMedia Encyclopedia* and *Jones in the Fast Lane*. Media Vision is also introducing a smartly designed \$1,295 external MPC upgrade kit called the CDPC, which consists of an external case housing a CD-ROM drive and 100 watts of audio power delivered to small built-in high-fidelity speakers; the case unit is connected to the PC via a SCSI card. The CDPC also provides a joystick, extra speaker ports, full MIDI capability, and an analog mixer. It comes with the same free software as the internal kit.

Media Vision's product line and the Pro AudioSpectrum board in particular will help the PC finally overcome its long-standing reputation as something that should be seen but not heard.

FACT FILE **Pro AudioSpectrum**; Media Vision, 47221 Fremont Blvd., Fremont, CA 94538; 800-845-5870. **List Price:** \$389; \$995 MPC upgrade kit; MIDI Mate adapter, \$69.95; internal cable/driver kit for CD-ROM drive, \$39; external cable/driver kit for CD-ROM drive, \$79. **Requires:** One full-length 8-bit expansion slot; for software: 640K RAM, hard disk, DOS 3.0. **Reviewed:** November 12, 1991, page 49.

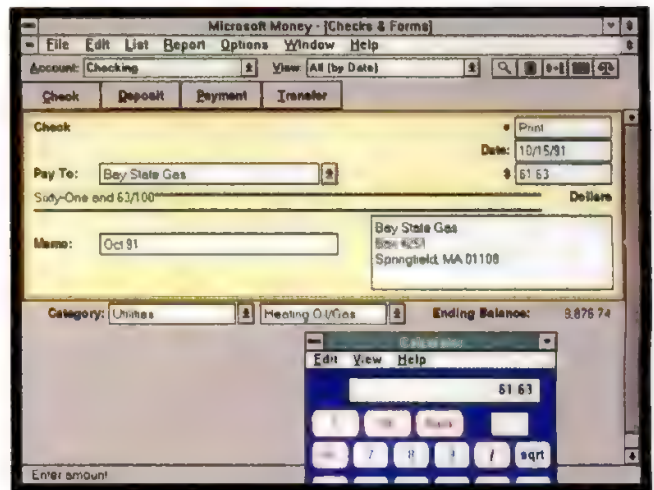
CIRCLE 428 ON READER SERVICE CARD

MICROSOFT CORP.

MICROSOFT MONEY

BY BILL HOWARD ■ There are two jokes about Microsoft Corp.'s products, with more than a little truth to them. The first involves Microsoft's long-winded habit of naming its products *Microsoft Something* rather than just *Something*, so the product sounds like a sponsored sporting event: The Microsoft-Bartles & Jaymes-USF&G-Hilton Head Pro-Am Classic. The second is that Microsoft products start with a lot of promise and become really good somewhere around Version 3.0. *Microsoft Money* fills the bill on both counts.

The \$69.95 package is a superior check-writing and account-balancing program. If you believe the best personal finance program is the one that gets the job done the fastest and with the least chance for error—who likes balancing a checkbook?—*Money* is the product of choice. Intuit's new DOS-based *Quicken*, Version 5.0, has a few features that some people can't live without, but *Money* is the easiest to use.



After you've created a transaction the first time (paying your electric bill, for instance), the next time you start to pay that bill again, *Money* automatically fills in the form for you. The most frequently used commands are conveniently located

Microsoft Money is a superior check-writing and account-balancing program for the personal finance market.

on a toolbar. And when it comes time to balance your checkbook, *Money* knows about the most frequent mistakes people make, such as transposing two digits in an amount, to help speed reconciliation. But because this is Version 1.0 of a Microsoft product, there's still a way to go: The report creation screen is brain-damaged, the program can't memorize frequently used reports, and the only screen font sizes are small and too small.

Why is billion-dollar Microsoft in this business? Personal finance is a pleasant little category for software companies today, but it could be a huge business by the end of the decade, especially as more transactions are electronic (who heard of buying groceries with a credit card ten years ago?), and as banks develop the ability to send you statements electronically. Version 10 of *Microsoft Money* or *Quicken* could be the product that tracks the financial comings and goings of your family or small business, while taking up even less of your time and delivering more features. Can you imagine if Microsoft could figure a way to get a penny on each transaction? Now you're talking money.

FACT FILE **Microsoft Money, Version 1.0**; Microsoft Corp., One Microsoft Way, Redmond, WA 98052-6399; 800-426-9400, 206-882-8080. **List Price:** \$69.95 (less \$5 rebate check valid through December 31, 1991). **Requires:** 1.7MB disk space, DOS 3.1, Microsoft Windows 3.0. **Reviewed:** November 26, 1991, page 40.

CIRCLE 429 ON READER SERVICE CARD

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In a hurry for a new computer? ZEOS has built up an extra supply of HOT new ZEOS Windows systems INCLUDING the LOTUS software bundle! These systems are READY TO SHIP RIGHT NOW. Call 800-423-5891!

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**ARTS & LETTERS GRAPHICS
EDITOR, VERSION 3.1**

CORELDRAW, VERSION 2.01

DESIGNER, VERSION 3.1

BY PAUL R. MURPHY ■ Until recently, if you were a designer or illustrator who used a computer, you couldn't realize the full extent of your talents unless you worked in the Macintosh environment. No longer: Today's PC-based illustration software programs, all of which run under Microsoft Windows, match the best the Mac has to offer. Our Best Of pick isn't so much a product as it is a product category: PC-based illustration software.

Leading the pack is *CorelDRAW*, Version 2.01, a drawing package with superior illustration, bitmap tracing, and special effects that are a joy to behold. While its most recent upgrade was mostly a fix of its terrific WFNBOSS utility, which translates most font types to *CorelDRAW* format and back, the core program has now matured into a major product for both professional designers and casual illustrators.

CorelDRAW hasn't been alone, however, in improving the performance and features of its products. Both Micrografx's *Designer* and Computer Support Corp.'s *Arts & Letters Graphics Editor* have added 16-bit color support (or 24-bit, in the former instance) and special effects features. *Designer* continues to position itself as a part-CAD part-illustrator program, and *Arts & Letters* appeals to many nonartists who are hooked by its 5,000-piece library of Editors' Choice-winning clip art. These three products continue to leap-frog each other in a features war that benefits end users. Many users have all three: best-selling *CorelDRAW* for its extreme ease of use and great type handling, *Designer* for its depth of features, and *Arts & Letters* for the images.

Success begets more products: Micrografx has released *Windows Draw*, a \$149 little brother to *Designer* with a majority of its sibling's features at less than one-third the price, and Aldus Corp. has announced a PC version of its popular Mac product, *Freehand* (\$595).

FACT FILE *Arts & Letters Graphics Editor, Version 3.1*; Computer Support Corp., 15926 Midway Rd., Dallas, TX 75244; 214-661-8960. **List Price:** \$695. **Requires:** 286-based PC or better (386 recommended), 2MB RAM, 10MB hard disk space, graphics adapter, DOS 3.1 or later, Microsoft Windows 3.0. Mouse recommended. **Reviewed:** October 29, 1991, page 341.

CIRCLE 603 ON READER SERVICE CARD

CorelDRAW, Version 2.01; Corel Systems Corp., 1600 Carling Ave., Ottawa, Ontario, Canada K1Z 8R7; 613-728-8200. **List Price:** \$695. **Requires:** 286-based PC or better, 1MB RAM, 20MB hard disk space, graphics adapter, mouse, DOS 3.1 or later, Microsoft Windows 3.0. **Reviewed:** October 29, 1991, page 341.

CIRCLE 604 ON READER SERVICE CARD

Designer, Version 3.1; Micrografx, 1303 Arapaho Rd., Richardson, TX 75081; 800-733-3729, 214-234-1769. **List Price:** \$695. **Requires:** 286-based PC or better (386 recommended), 1MB RAM, 10MB hard disk space, graphics adapter, mouse, DOS 3.1 or later, Microsoft Windows 3.0. **Reviewed:** October 29, 1991, page 341.

CIRCLE 605 ON READER SERVICE CARD

MOTOROLA CODEX

MOTOROLA CODEX 3260

BY STEVE RIGNEY ■ Most users of older 2,400-bit-per-second modems are ready for higher speeds and better data compression and error control. The emerging standard isn't 9,600 bps but a superset that runs at 14,400 bps: V.32bis rather than V.32. Until V.FAST modems are ready, V.32bis offers the best choice. With V.42bis data compression, the right kind of files, and a good telephone line, V.32bis can move data at 38.4 kilobits per second on a dial-up circuit. By this time next year, the market will be swimming in V.32bis modems; among a small but rough bunch of competitors, the Motorola Codex 3260 emerges as the best high-speed modem for dial-up lines. Priced at \$1,195, the 3260 is not the most expensive of its breed, but it has the smoothness and bearing of royalty.

The Motorola Codex 3260 modem pushes data at the highest speeds over dial-up phone lines.



The Codex 3260 complies with all major standards, featuring MNP 4 and V.42 error handling, MNP 5 and V.42bis compression, synchronous and asynchronous operation, an internal power supply that makes bulky power cubes unnecessary, a 16-character LCD, and six LEDs. You can completely configure the modem from its front panel or from the RS-232 port. All configurations can be password-protected.

The Codex 3260's adaptive phase compensation and far-

The Real Surprise
Isn't That We
Fit VGA,
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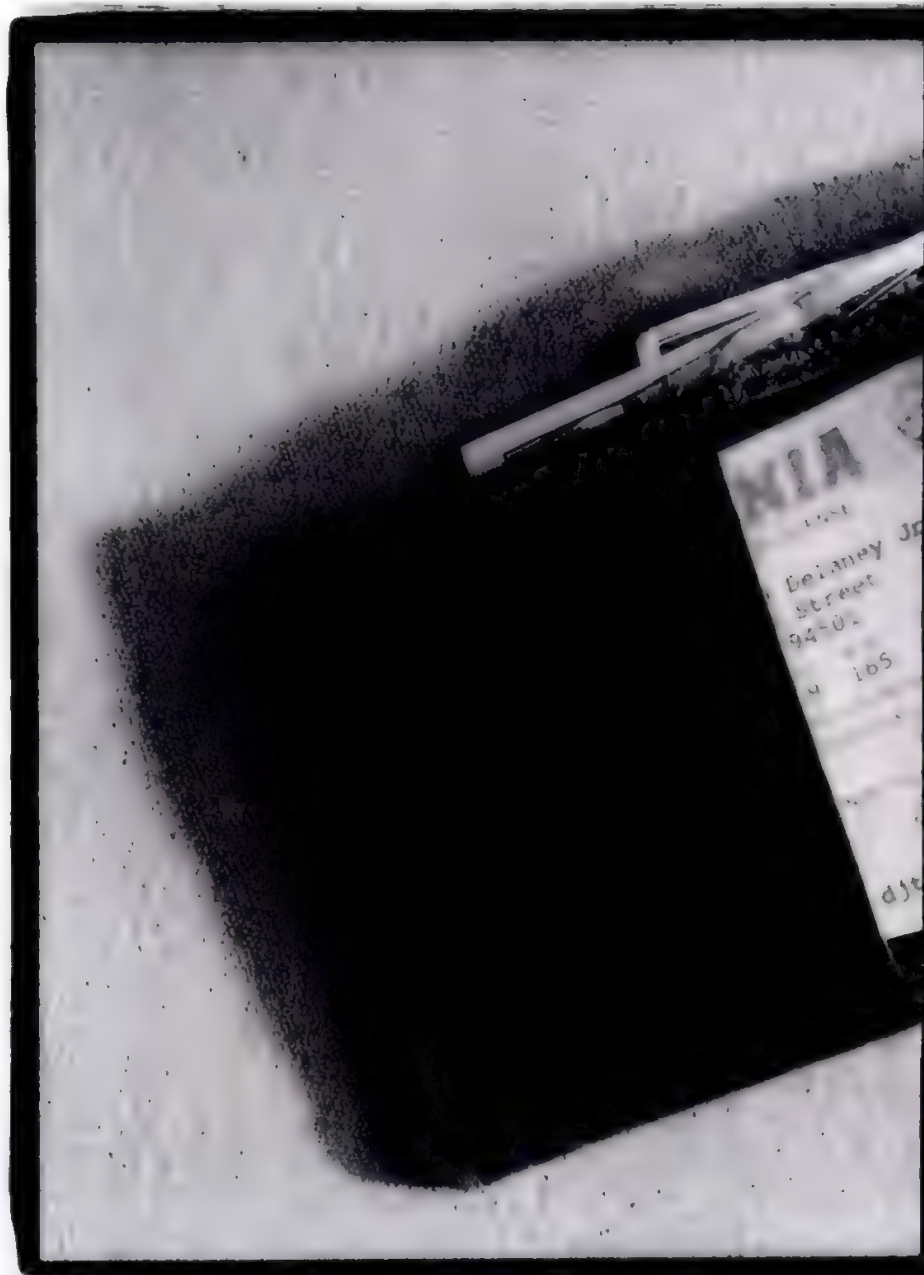


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- Supports i387SX Math Coprocessor



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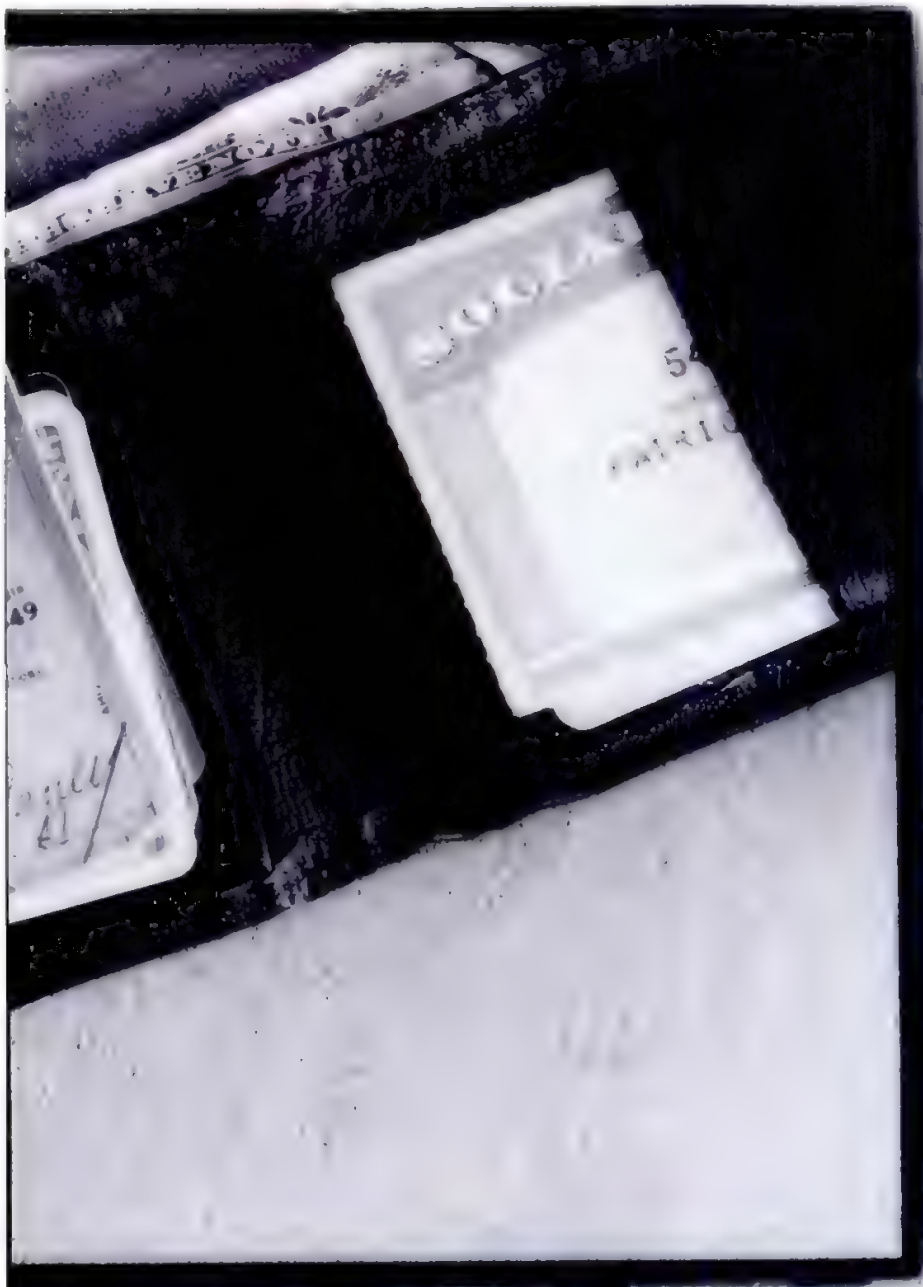
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end echo cancellation help ensure reliable performance. It also offers network management, but on the bottom line you get peace of mind. The Codex 3260 isn't the most economical high-speed modem, but you'll be happy with it for a long time.

FACT FILE **Motorola Codex 3260;** Motorola Codex, 20 Cabot Blvd., Mansfield, MA 02048; 800-446-6336, 508-261-4000. **List Price:** \$1,195. **Requires:** RS-232 cable. **Reviewed:** Not previously reviewed in *PC Magazine*.
CIRCLE 542 ON READER SERVICE CARD

MICROSOFT CORP.

MULTIMEDIA BEETHOVEN

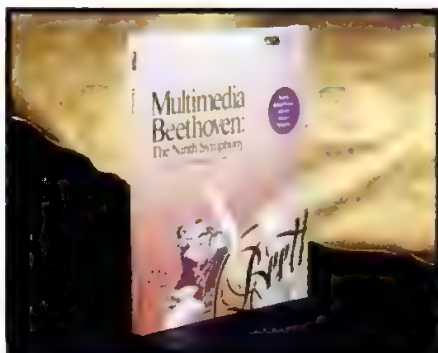
BY CHARLES PETZOLD ■ If any one work might be chosen to represent the whole of Western European music, Beethoven's Symphony No. 9 in D Minor is probably it. Imagine listening to a compact disk of the Ninth Symphony under PC control while reading intelligent synchronized on-screen commentary that traces the music's every twist and turn. What a concept! And what a way to demonstrate the transition from the age of stodgy spreadsheets and databases to the far-reaching vision of multimedia!

Multimedia Beethoven is one of Microsoft's first CD-ROM publications for Multimedia Windows, and it's a stunning debut. Created by The Voyager Co. with text by UCLA musicologist Robert Winter, *Multimedia Beethoven* consists of a CD of Beethoven's Ninth Symphony (Hans Schmidt-Isserstedt conducting the Vienna Philharmonic, 1965) with support software added.

The most successful part of the package plays the CD while the on-screen commentary changes every 15 seconds or so. You can back up, repeat sections, and skip others, all from your PC. The commentary captures the audacity, wit, and complexity of Beethoven's music. It is entertaining, rarely condescending, and only occasionally silly.

Less successful (consisting mostly of on-screen text and pictures) are sections discussing Beethoven's life,

The innovative CD-ROM publication *Multimedia Beethoven* plays Beethoven's Ninth Symphony, accompanied by on-screen commentary.



world, and music. However, Robert Winter is brave enough to tackle the sticky area of performance practices; he even delves into a detailed analysis of sonata form.

For newcomers to classical music, *Multimedia Beethoven* is a superb introduction. For old-timers, it's an illuminating revisit to familiar territory. And for anyone interested in glimpsing what the next ten years of personal computing will bring, *Multimedia Beethoven* justifies the whole unwieldy concept of "multimedia."

FACT FILE **Multimedia Beethoven;** Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 206-882-8080. **List Price:** \$79.95. **Requires:** Multimedia PC, Microsoft Windows 3.0 with Multimedia Extensions 1.0, MS-DOS CD-ROM Extensions 2.2 or later. **Reviewed:** Not previously reviewed in *PC Magazine*.
CIRCLE 543 ON READER SERVICE CARD

MICROSOFT CORP.

MULTIMEDIA EXTENSIONS FOR MICROSOFT WINDOWS 3.0

BY LORI GRUNIN ■ Microsoft's Multimedia Extensions for Microsoft Windows 3.0 is truly evolutionary in the Darwinian sense of the word. Its services are essential for any software developers who wish to create next-generation applications with multimedia features.

With the proper add-in hardware, your PC has long been capable of running gee-whiz applications that use MIDI and digitized audio, digitized and remote-controlled video, animated graphics, and CD-ROM disks. However, any developer writing such applications also had to guarantee drivers for all the disparate video and audio hardware on the market. By providing an application program interface (API) layer between the drivers and the software (called the Media Control Interface or MCI), Multimedia Extensions removes the hardware-support burden from software developers and gives programmers the incentive they need to incorporate audio and video with a lot less risk.

Multimedia is not a new concept; not by a long shot: Macintosh and Amiga users have long reaped many of the same benefits. Nor is Microsoft the only company to create a multimedia API for the PC. This past year, Software Publishing Corp. announced its Virtual Media Control Interface, which claims to provide the same functionality for DOS users as well as support for the Windows MCI. But such an API works best as part of an integrated, transparent environment, which puts Microsoft Windows at a unique advantage.

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FACT FILE **Multimedia Extensions for Microsoft Windows 3.0;** Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 206-882-8080. **List Price:** Free with MPC-compatible computers and peripherals. **Reviewed:** Not previously reviewed in *PC Magazine*.
CIRCLE 544 ON READER SERVICE CARD

NEC TECHNOLOGIES INC.

NEC MULTISYNC FG SERIES

BY MARY KATHLEEN FLYNN ■ NEC's new generation of MultiSyncs start with an up-to-date feature set and adds an exciting new feature: color control.

NEC's AccuColor Control makes customizing on-screen colors as easy as pushing a button—an especially important



capability if you're trying to match on-screen output with printed material. If you want brighter blues than the factory setting, just press the Blue Increase button a few times and watch the screen lighten up. For deeper blues, press Blue Decrease.

NEC's line of MultiSync FG monitors let you increase or decrease the brightness of a color by pressing a button.

Even without AccuColor, the new MultiSync FG monitor series is a winner. All four FG monitors come standard with the latest got-to-have features: bigger, flatter screens; high non-interlaced resolutions; high refresh rates for flicker-free operation; low EMF emissions; front-panel digital controls; and cabinets clean enough for the executive wing.

The screens on the FG monitors are an inch bigger than their predecessors in the D series. And because their screens are flatter, they look even larger.

NEC lowered its dealer margins last summer, so street prices will be discounted less than previously. At press time, only two were shipping: the only non-AccuColor unit, the \$749

15-inch MultiSync 3FGx (estimated street price: \$600 to \$700), and the \$899 15-inch MultiSync 4FG. NEC expects to ship the \$1,599 17-inch MultiSync 5FG (which should be between \$1,300 and \$1,400) and the \$3,499 21-inch MultiSync 6FG (\$3,000) by the beginning of 1992. NEC has stopped making the NEC MultiSync 3DS (street price: \$600) and will stop making the MultiSync 5D (\$2,200) but will continue to manufacture the NEC MultiSync 4DS (\$950) and the MultiSync 2A (\$400).

FACT FILE **NEC MultiSync FG series;** NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191; 800-366-3632, 708-860-9500. **List Price:** NEC MultiSync 3FGx, \$749; NEC MultiSync 4FG, \$899; NEC MultiSync 5FG, \$1,599; NEC MultiSync 6FG, \$3,499; optional MultiSync monitor lens, \$79-\$199. **Reviewed:** November 12, 1991, page 35.

CIRCLE 545 ON READER SERVICE CARD

SYMANTEC CORP.

THE NORTON UTILITIES, VERSION 6.0

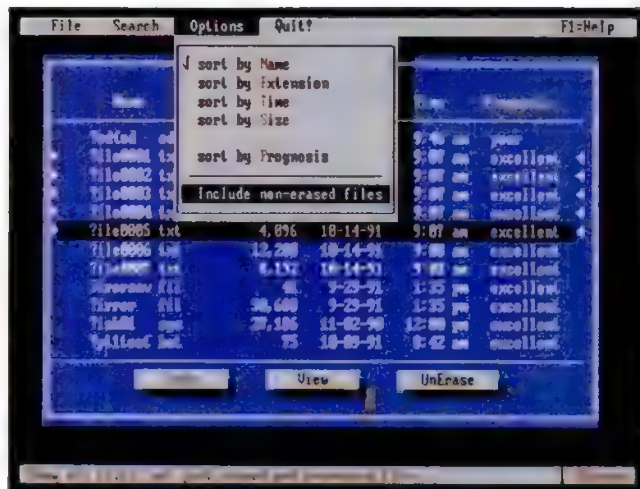
BY EDWARD MENDELSON ■ With *The Norton Utilities*, you can do to a disk almost anything worth doing, and you can undo almost anything you wish you had never done.

You'll use Symantec's \$179 Version 6.0 of the classic *Norton Utilities* in many situations.

Most often, you'll think of it when you need to recover erased files, which it does more quickly and elegantly than anything else.

In case of emergency, you'll call on the Norton Disk Doctor, which

***The Norton Utilities* includes many programs for rescuing files and disks, along with a COMMAND.COM replacement.**



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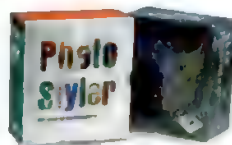
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equals or betters all other disaster recovery programs in its speed, safety, and power. And when you need to tinker with files, FATs, and even the partition table, you'll call on Norton's DiskEdit program, which delves deeper into your disk than any of the competition and even lets you open one window on a file and another on the FAT or directory.

Norton also includes a defragmenter, a disk testing and interleave program, a TSR that warehouses deleted files, file encryption and other security measures, a cache, a file finder, and more. All programs work smoothly with DOS 5.0 high memory and task switching.

Perhaps Norton's biggest bonus is NDOS, a complete replacement for COMMAND.COM (based on the shareware 4DOS) that despite some quirks makes Microsoft Corp.'s version look prehistoric.

Norton's eminence comes under repeated attack by *PC Tools*, whose disk utilities include a few conveniences (like file viewers) you won't find in Norton. But Norton continues to be elegant, reliable, and, as always, indispensable.



management features you need (if not the C/SSR and C/SCSC analysis required for federal contract work), it avoids the jargon and complexity of other packages.

On Target takes a direct approach to project management that builds on familiar spreadsheet and database concepts.

For example, to change a project's duration, either make the change in the spreadsheet or just click and drag that task's time line. Done. Just that fast.

On Target is the project manager of choice for mainstream business. Make sure you really need other programs' additional features—and want their headaches—before you dismiss *On Target* as too good to be true.

FACT FILE *The Norton Utilities, Version 6.0*; Symantec Corp., 10201 Torre Rd., Cupertino, CA 95014; 800-343-4714, 408-253-9600. **List Price:** \$179; upgrade, \$39. **Requires:** 512K RAM, DOS 2.0 or later. **Reviewed:** September 10, 1991, page 35.
CIRCLE 546 ON READER SERVICE CARD

FACT FILE *On Target, Version 1.0*; Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014; 408-253-9600. **List Price:** \$399. **Requires:** 286-based PC or better, 1MB RAM (2MB recommended), EGA graphics adapter or better, DOS 3.1 or later, Microsoft Windows 3.0. Mouse recommended. **Reviewed:** August 1991, page 44.
CIRCLE 547 ON READER SERVICE CARD

SYMANTEC CORP.

ON TARGET, VERSION 1.0

BY JIM SEYMOUR ■ Project management software has long been the ugly duckling among PC applications. As powerful and useful as project management—the technique—can be, project management software has been convoluted, confusing, and forbidding.

In one stroke, Symantec has broken through that barrier, with the first really civilized project manager for PCs. Brilliantly exploiting Microsoft Windows 3.0's graphical interface, it builds on metaphors many PC users already understand and feel comfortable with—spreadsheets and databases—to get you to work right away.

That "let's get to work" approach is underscored by a passel of included project-management templates you can adapt to your purposes more quickly than you can build even an *On Target* project from scratch.

You start with a spreadsheet on the left half of your screen, and a graphical time line on the right. While *On Target* includes the resource leveling, Gantt's and PERT's, and other project

CENTRAL POINT SOFTWARE

PC TOOLS, VERSION 7.1

BY EDWARD MENDELSON ■ No utility package matches the ambitions of *PC Tools*, Version 7.1. Central Point Software's \$179 combination of Swiss Army knife and one-man band not only includes an application launcher that can run everything in your computer, it now has a remote control that lets you take over someone else's computer.

The heart of *PC Tools* is its shell program, from which you can run the package's backup program, disk utilities, security programs, and desktop—with its calculators, notepad, database, outliner, and communications module. Installation automatically adds to the menu most applications that it finds on your disk and even lets you use Microsoft Windows-like file associations to launch a program by clicking on the name of a data file. You can run Shell and Desktop as TSRs.

PC Tools looks like a character-based version of Windows and uses CUA-standard keystrokes throughout. In case you

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I personally found Great Cities of The World fascinating, it's packed with information on hotels in Paris, entertainment in New York, bull fights in Madrid and shopping in London.

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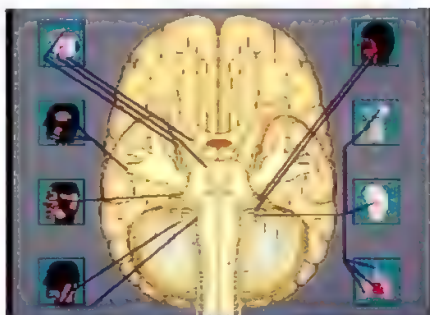
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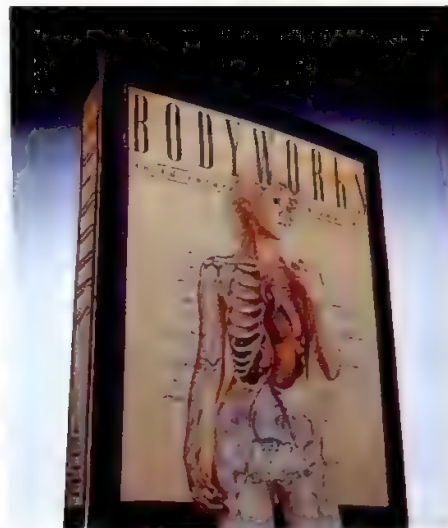
Explore the cardiovascular system...

ment, far beyond the capabilities of even the most sophisticated camera. Move to the nervous system, and how the signals sent to the brain can detect even the slightest touch to the skin. Learn about how your nervous system allows the brain to instruct the body to perform complex movements — like walking! Then select the digestive system — the body's systematic breaking down of food. Its incredible ability to process and extract nutrients. From the mouth to the intestines, BODYWORKS shows you in great detail how your body nourishes itself, how it accumulates fatty tissue (and how it uses fat).



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There are complete sections on lymphatic, endocrine and cardiovascular systems. Explore the most amazing four-square-inches of tissue man has ever seen — the human heart. How it feeds the body with a constant supply of necessary chemicals to sustain life. You'll learn how the human heart can be damaged, and exactly what happens when someone suffers a heart attack. When your child asks "Where do babies come from?" you can simply select the section on the human reproductive system for a clinical



explanation of the process.

You'll see all of the organs and tissues of the body, each described in exhaustive detail. Colorful graphic screens also provide information on sports injuries, first-aid advice on illness, insect and animal bites, along with other topics. This program is simple to use, just click or select any organ or system for instant retrieval of BODYWORKS' thousands of facts. A must for the home computer.

Software Marketing Corp.

BODYWORKS

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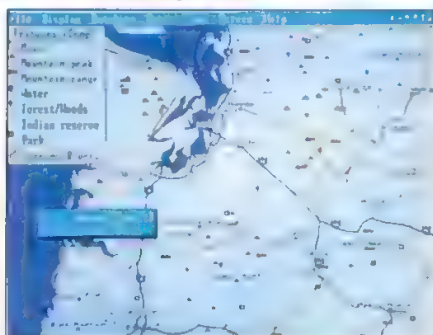


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AUTOMAP also gives you a list of "places" from over 500,000 in its database. It's like having a travel guide pointing out the very best there is to see and do. If you're a business traveler, you won't have to

worry about being unfamiliar with new territories, just a quick session with AUTOMAP and you'll not only know exactly where you're going, you'll be on the very best road to get there.



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Government Highway Data.

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racy of government sources. It has been designed to remain accurate with constant updates of new maps and details as they become available. AUTOMAP has proven itself with the most demanding businesspeople and vacationers. It's helpful and convenient, but more importantly, AUTOMAP will save time, money and frustration. In fact, surveys show that AUTOMAP can easily save up to 20% in driving time and related costs.

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BAF4098-3 AUTOMAP 3 1/4"	\$79.95
<i>Hercules, CGA, EGA, VGA, 512K RAM, hard disk, mouse recommended.</i>	

With This Mouse, You May Never Touch Your Keyboard Again.

It's a new generation of super-mice. So advanced, they're a revolutionary advancement in mouse technology. So high-quality, the competition pales in comparison. ProHance offers 3 incredible models to fit every need. With the keys you use most right on your mouse, you'll fly through tasks with blistering speed and efficiency.

Put your most-used keys literally at your fingertips, plus all 10 Function keys. I used to go back and forth between keyboard and mouse all the time. Now I do 90% of my work right from my fast, easy mouse. PgUp, PgDn, Home, End, Insert, Delete, Backspace, Enter and Escape are all right where I need them most. I work faster and I'm more relaxed with my smartly-designed ProMouse.

PowerMouse. It's Magic.

PowerMouse has all the features of ProMouse, plus the power of amazing macros assigned to buttons on your mouse. PowerMouse uses the same key for the same function — no matter what program you're in. Press the Copy button, whether you're in Windows, WordPerfect, 1-2-3 or a slew of others, and PowerMouse performs the copy. When you learn PowerMouse, you learn 20 programs at once!

1-2-3 users say PowerMouse is mandatory for serious spreadsheet use. I formatted an entire brochure with only my mouse.

If you have limited space, there's



calculator. With it's full numeric keypad, it's ideal. Then I take it to the office and use it there too!

ProMouse, PowerMouse and PowerTrack are the most exciting things ever to happen to mice. From the silky smooth movements to the space-age technology, these unique devices let you work faster, easier, smarter. And those special command keys let you work having less to remember.

PROHANCE

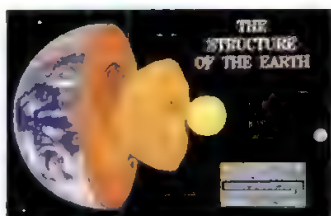
BAF4085 ProMouse	\$69.95
BAF4087 PowerMouse/100	\$129.95
BAF4086 PowerTrack	\$129.95

The "Space-Atlas"

Orbits is a brilliantly interactive space simulator and comprehensive space atlas that brings the universe to your PC! Spectacular 3-D graphics demonstrate the operation of our solar system. Animated sequences show you the effects of gravity on various planets, the movement of the Sun and moon. Compare the planets' characteristics, structure, chemical makeup and more. Simulations of eclipses, nuclear processes of the Sun and the life of comets. View actual satellite photographs from NASA and the Jet Propulsion Laboratory, watch a spectacular presentation on the birth and death of the Sun. See the interior structures of the Sun and moon, create reports and comparisons on anything, and play a few rounds of Orbit-Trek, the built-in brain teaser. A great educational tool, Orbits is also an entertaining way to spend some time with your PC. It brings the stars, the planets and beyond — into focus.

Just wandering through this program is a joy. Orbits is packed with so many intriguing, colorful screens and great information that it's hard to stop. It has been meticulously researched, the graphics professionally prepared. More than an astronomy program, Orbits takes you to the wonders of the universe — and gives it an interesting spin! A great program for students — even smaller children.

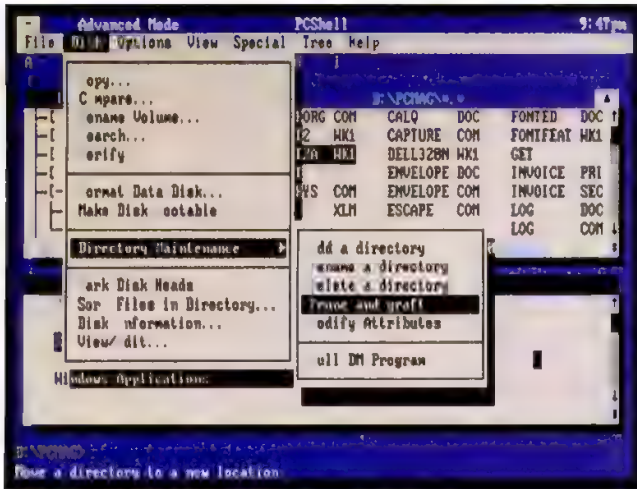
Software Marketing Corp.



ORBITS

BAF4103-5 Orbits 5 1/4"	\$59.95
BAF4103-3 Orbits 3 1/4"	\$59.95

THE BEST OF 1991 COVER STORY



prefer real Windows, *PC Tools* gives you Windows versions of its backup and undelete programs.

Version 7.0 of *PC Tools*, released with too little testing, was too bug-ridden to be let loose on innocent disks, but Version 7.1 cleans up all serious problems. Compared with *The Norton Utilities*, *PC Tools* is sometimes slower and more awkward. But it gives you most of what *Norton* provides, and throws in a DOS shell and a few dozen other features such as application-specific file viewers. *PC Tools*, Version 7.1, is more than a bargain; it's the whole store at a bargain price.

PC Tools provides valuable utilities, ranging from a remote-control program to a calculator, notepad, and database.

FACT FILE *PC Tools*, Version 7.1; Central Point Software, 15220 NW Greenbrier Pkwy., Beaverton, OR 97006; 800-445-4208, 503-690-8088. **List Price:** \$179. **Requires:** 640K RAM, DOS 3.0 or later. **Reviewed:** September 10, 1991, page 35. **CIRCLE 548 ON READER SERVICE CARD**

SYMANTEC CORP.

Q&A, VERSION 4.0

BY JIM SEYMOUR ■ Put simply, *Q&A*, Version 4.0, is the best way we know to produce mail-merged form letters. Combining a slick, easy-to-use word processor with a plain, easy-to-use flat-file database program, with close links and operational consistency between the two, Symantec Corp. came up with a winner when the program was first released to the public about five years ago.

To call *Q&A* only a slick mail-merge package is to miss many of its strengths. *Q&A Write*, its word processing module, has grown from a sometimes simplistic writing tool to a

powerful, office-level word processor with support for proportional and scalable fonts. And while the database module is still only flat-file, not relational, it can handle surprisingly complex jobs. Features include a posting function (which allows current data to be transferred to an external *Q&A* database file) and improved memory management.

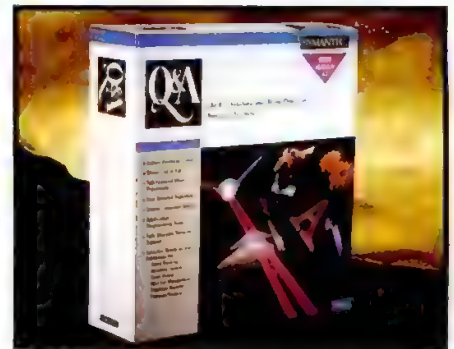
This year's Version 4.0 not only continues that growth but stretches both *Q&A*'s word processor and its database manager into new realms. External lookups are easier and now

Version 4.0 of *Q&A* stretches its word processor and database manager capabilities into new realms.

extend to *dBASE III* and *IV* data files. Now *Q&A* can also write to its own external database files via Version 4.0's posting function. There's even SQL support for *Gupta* and *Oracle* SQL

servers. The word processor finally manages proportional and scalable fonts; there's a new thesaurus; memory management and programming functions have been improved; and if you have a graphics card, you can get a usable page preview.

This is about as simple as word processing and database management get, yet *Q&A*, Version 4.0, is plenty powerful for serious business use. If you think that's a paradox, *Q&A* will change your mind.



FACT FILE *Q&A*, Version 4.0; Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014; 408-253-9600. **List Price:** \$399; network pack (adds three users), \$499; upgrade from Version 3.0, \$85. **Requires:** 512K RAM (640K recommended), DOS 2.0 or later; DOS 3.1 or later for networks. **Reviewed:** September 10, 1991, page 48. **CIRCLE 550 ON READER SERVICE CARD**

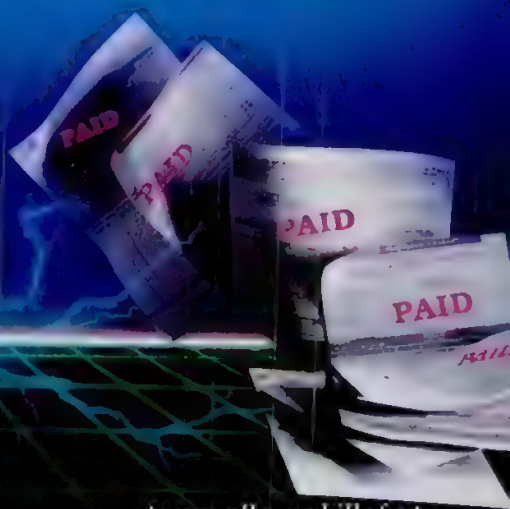
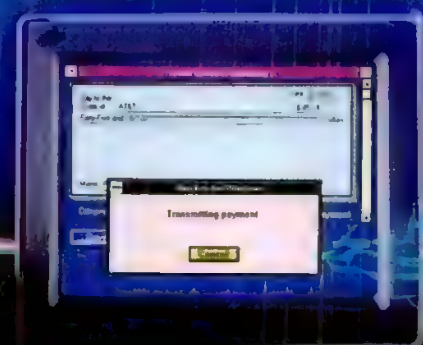
LUCASFILM GAMES

SECRET WEAPONS OF THE LUFTWAFFE

BY BILL O'BRIEN ■ One of the primary rules of warfare is to know your enemy. Like its previous two releases, *BattleHawks: 1942* and *Battle of Britain: Their Finest Hour*, Lucasfilm Games' *Secret Weapons of the Luftwaffe* is designed to give an accurate portrayal of the technology of war, this time in the European theater.

If you use Quicken, you never have to write, sign or mail a check to pay a bill ever again.

Did you know that you already own this remarkable technology? Quicken and CheckFree give you direct access to the same electronic clearing system every bank uses...



...to pay all your bills faster and easier than ever.

If you own Quicken® and a modem, you already have everything it takes to end signing checks and writing out return addresses, licking envelopes and stamps, and going to the post office.

One keystroke eliminates all that hassle. Thanks to Quicken's built-in CheckFree® electronic payment capability. It's as easy and dependable as Quicken itself.

Here's how it works.

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2. ... Don't print or hand write checks! Simply enter the dates for payments, press a key – and Quicken zaps the information to CheckFree's Processing Center.

3. CheckFree makes your payments through the Federal Reserve system, the payments clear your bank, and complete descriptions are printed on your monthly bank statement.

If a payee isn't set up for electronic payments, CheckFree sends a laser-printed check. And of course, you can still use Quicken checks – or your bank's checks for that matter – any time you want.

Proven safe and reliable.

You can have confidence in the CheckFree system that already handles some \$2 billion every year in electronic payments through the Federal Reserve system. Tens of thousands of "electronic checks" clear this way every day.

For several years, Quicken users have been leading the switch to electronic bill paying. After all, they're among the first to computerize their personal finances.

Join the thousands who would never go back to the time-consuming hassles of paying bills the old-fashioned way.

Try CheckFree with no risk – and get one month of service FREE!

Your first month of CheckFree service is free. And if you don't agree it makes bill paying with Quicken even faster and easier, we'll even refund usage fees for the next 60 days.

When you add up what you spend now on postage, envelopes and check charges – not to mention your time – CheckFree is an exceptional value. Just \$9.95 a month, charged to your bank account, covers up to 20 payments. After that, it's \$3.50 per 10 or any portion thereof.



Quicken – the fastest, easiest way to organize and control your finances.

If you don't already own Quicken, you'll be amazed how fast it gets your home finances or small business finances organized. The screens look just like your paper checkbook and work the same way, so you can be using Quicken within 15 minutes.

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THE BEST OF 1991 COVER STORY

Secret Weapons will work with any color display at or below VGA level, while using 256 colors in standard VGA resolution to its best advantage. The cockpit



detail is phenomenal, right down to the VDO label on the gauges in the German aircraft. The compromise for slower systems is a settable detail level that runs the gamut from almost none (except for aerial and ground targets) to striking renditions with near maplike quality.

You create and train pilots to participate in more than 1,000 different missions rated at moderate, difficult, and "impossible" levels of combat. These progress historically (although you can optionally allow an advantage to one side). You can also customize campaigns and, in effect, try to rewrite the history of the war.

As an American, your tools of war are the P-47 Thunderbolt, the P-51 Mustang, and the B-17 Flying Fortress. The Germans have the propeller-driven Bf-109 and FW 190 as well as three jets, the ME 163B Komet, the ME 262, and the Go 229, an early ancestor of the Stealth Bomber. Scheduled for release in the near future is a series of airplane disks, the first of which will feature the P-38 Lightning.

If war is hell, *Secret Weapons of the Luftwaffe* is one hell of a war game.

***Secret Weapons of the Luftwaffe* depicts World War II-style air battles with strikingly realistic detail.**

FACT FILE *Secret Weapons of the Luftwaffe*; Lucasfilm Games, P.O. Box 10307, San Rafael, CA 94912; 800-782-7927. **List Price:** \$59.95. **Requires:** 640K RAM (for IBM) or 768K (for Tandy); EGA video display or better; mouse, joystick, or keyboard; AdLib, Sound Blaster, or internal speaker. **Reviewed:** See After Hours in this issue.
CIRCLE 001 ON READER SERVICE CARD

DELIRIA TECHNOLOGY INC.

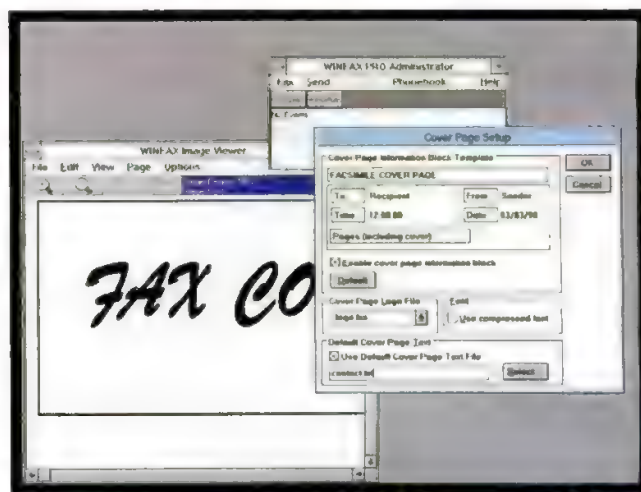
WINFAX PRO

BY ALFRED POOR ■ Everybody hates something about fax machines; what do you hate? Flimsy paper? Jammed pages? Punching in phone numbers? Sure, you can from your PC, but the fax software can be cranky and cumbersome.

But now there's *WinFax Pro*, a Microsoft Windows program that lets you send faxes as easily as printing to your printer. That's because it installs like a printer driver, so anything you can print under Microsoft Windows can be sent out through a fax modem.

Unlike its predecessor, which was limited to send-only modems, *WinFax Pro* supports a wide range of fax modems, including Intel's SatisFAXtion, all CAS-compatible units, and other send/receive modems. As with the earlier version, you can assemble a document from multiple applications, maintain phone books and group listings of fax phone numbers for batch transmissions, and schedule faxes for delayed sending.

WinFax Pro adds lots of new features, however, like ad hoc messages on cover pages, mail-merge letters, rotated pages when assembling faxes to send or viewing received faxes, and



***WinFax Pro's* features include a window for viewing fax files and a cover sheet facility that lets you include custom logos and imported text.**

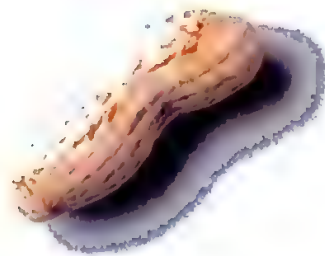
custom logos or letterheads on the cover page. The product also supports network fax servers.

You can buy the program on its own, but you're likely to find it bundled with modems and computer systems, too. AST Research, CompUSA, Laser Computer, Prometheus Products, PureData, and Zoom Telephonics, for example, plan to include OEM versions with their hardware.

If you're tired of hating PC-oriented faxing, check out *WinFax Pro*.

FACT FILE *WinFax Pro*; Delrina Technology Inc., 6830 Via Del Oro, #240, San Jose, CA 95119-1353; 800-268-6082, 408-363-2345. **List Price:** \$119. **Requires:** Microsoft Windows 3.0, compatible computer fax board (Intel SatisFAXtion, CAS-compatible modem, or Class 2 fax modem). **Reviewed:** December 17, 1991, page 58.
CIRCLE 002 ON READER SERVICE CARD

**WE HAVE A FEW WORDS FOR PEOPLE
WHO DEMAND HIGH PERFORMANCE AND
EXPECT TO PAY PEANUTS FOR IT.**



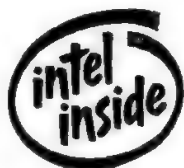
DELL
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CORPORATION

MORE POWER TO YOU.

You wanted it, you got it.

Introducing the Dell® 486P/20. A computer that gives you an i486™ SX processor at the price of an i386™ DX machine.

An incredible performance boost of up to 40% at virtually no additional cost.



Generating enough processing power to exploit the full potential of future versions of Microsoft® Windows™ and OS/2®.

Making whatever software you run, run that much faster.

Giving you quicker recalcs, database compiles and screen refreshes.

In short, getting rid of excess wait.

And if that isn't impressive enough, the Dell 486P/20 comes with an upgradeable processor that can go from a 20 MHz i486SX chip all the way up to a high-end 33 MHz i486DX system, and even beyond.

Which, considering that we're talking about a computer under \$2,000, is nothing short of revolutionary.

A true power user's desktop. For its low price, the Dell 486P/20 has a lot of technical innovations you wouldn't expect to find on even higher end machines. Things like programmable Flash EPROMs, for example, that make conventional methods of upgrading system BIOS seem almost obsolete. You won't have to take this computer apart and lose your patience trying to pry out a reluctant chip. Just slip in a diskette—that's all.

Expanding memory is equally convenient. One of the few PCs to support 16 MB SIMMs, the 486P/20 carries 4 memory expansion sockets, on its main board. So as your needs grow, you can keep adding RAM in 1, 4, or 16 MB increments up to a total of 64 MB. That's plenty of room to run your networking software, Microsoft Windows and just about any high-performance graphics application.

And talking about graphics, a small expansion of video memory to 1 MB (512K is standard) will put over 32,000 colors at your disposal, letting you create images that approach photographic quality.

The 486P/20 also makes those images a lot easier on your eyes. It supports up

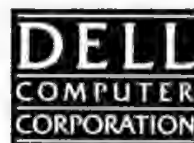
to 1024 x 768 non-interlaced video at a fast 70 Hz refresh rate for a flicker-free display. Unlike the kind you get on some competitive machines that are limited to 60 Hz non-interlaced.

An i486SX processor with the future built in. Because the Dell 486P/20 upgrades via a processor chip instead of traditional processor cards, upgrading takes the form of a single, economical step:

Just remove one chip and replace it with a higher performance version.

On the other hand, if you never need to upgrade at all, you don't end up having paid a price penalty to get the system in the first place. Either way, you win.

Apart from the processor, the 486P/20 is also designed to allow easy upgrading of hard disks, memory and video capability. So when your needs change, the rest of your computer can, too.



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THE MORE YOU SAVE.

We've just mentioned, here's an amazing fact: feature for feature, you can get an outstanding savings increase with the sophistication of the Dell System[®] you buy. So go ahead, read on. The more the more our i486 systems cost, the less they actually cost.

MORE SPEED

From desktop publishing to spreadsheet applications, there's one feature that's always welcome, and that's speed. With quick recalcs and lightning fast screen refreshes, you'll get your work done faster with the Dell 486P/33.

The 33MHz i486DX processor generates up to 80% more performance than 33MHz i386DX systems. If that leaves you craving for more, you can upgrade to a faster i486 processor when available.

This 486P/33 configuration features a 100 MB hard drive with a phenomenal 15 ms average access time. An 8 KB cache in the processor boosts performance. And dual floppy drives allow you to read any diskette, regardless of MS-DOS format.

A 1024 x 768 non-interlaced big 15" color monitor with overscan gives you 30% more viewable area than the standard 14" you get with any competitively priced system. For even more versatility on desktop publishing or graphic-intensive applications, just expand video RAM to 1 MB and you'll get a 32,000 color, near-photograph quality display.

The system comes with 4 MB RAM on 32-bit SIMMs with gold-plated connectors, MS-DOS 5.0, Microsoft Windows 3.0 and a Microsoft Mouse.



THE DELL 486P/33 33 MHz i486DX SYSTEM. [®]
SYSTEM INCLUDES 100 MB HARD DRIVE, ULTRASCAN 15C MONITOR,
5.25" 1.2 MB AND 3.5" 1.44 MB FLOPPY DRIVES AND 4 MB RAM

SAVE \$948[▽]

MORE GRAPHICS

The Dell 486D/33 has every high-end feature you'd expect in an outstanding graphics workstation. Except a high-end price tag.

There's a superfast 33 MHz i486DX processor, with 8 KB internal cache. For even greater performance, all you'll need to do is replace a processor chip. So you can upgrade inexpensively as soon as new chips hit the market.

Should your workload, heaven forbid, triple by then, you'll still find the 200 MB hard disk more than adequate.

And as your requirements become increasingly more sophisticated, you can keep adding to the 486D/33's 8 MB RAM. With a maximum of 64 MB, there's plenty of room to grow.

Talking about room, we have a large 15" flat square monitor with 30% more viewable area than a standard 14" monitor, which makes those large spreadsheets and high resolution documents much easier to read.

The Dell 486D/33 comes with factory-loaded MS-DOS 5.0, Microsoft Windows 3.0 and a Microsoft Mouse.



THE DELL 486D/33 33 MHz i486DX SYSTEM. [®]
SYSTEM INCLUDES 200 MB HARD DRIVE, ULTRASCAN (1024 x 768) 15C MONITOR,
5.25" 1.2 MB AND 3.5" 1.44 MB FLOPPY DRIVES AND 8 MB RAM

SAVE \$1,348[▽]

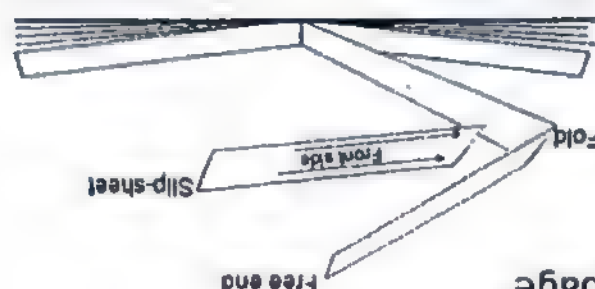
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11/99



THE DELL 486P/20 20 MHz i486SX SYSTEM.*
SYSTEM INCLUDES 50 MB HARD DRIVE, VGA COLOR MONITOR, AND 2 MB RAM.



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4. Close the page and slip-sheet

Inverted Foldout slip-sheet

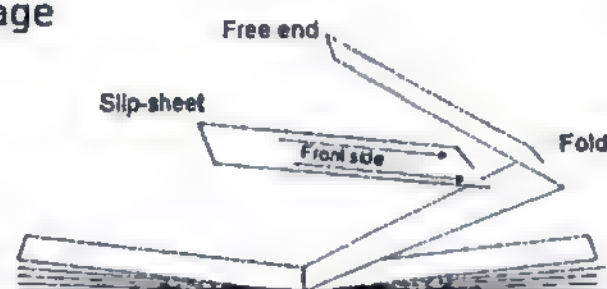


GbsSlipSheet-001

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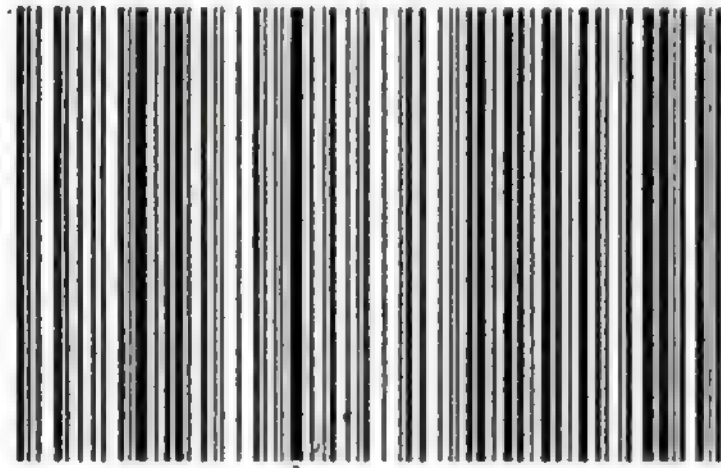
Foldout slip-sheet

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4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs51pBack-001B

Back

1. Follow instructions on the other side

THE MORE YOU GET, T

If your requirements call for a more powerful or specialized system than the one you have, you can even better deal with our higher-end i486 systems. From \$248 all the way up to a whopping \$1,348, you can get it. And if you still have any doubts, call us. We'll be happy to explain.

MORE VALUE

The Dell 486P/20 is a 20 MHz i486SX general purpose workstation you can upgrade to 33 MHz and beyond.

For a configuration that costs so little, you sure get a lot.

Like programmable Flash EPROMs for easy BIOS upgradeability.

And an 80 MB hard disk drive with 15 ms access time.

And an 8 KB cache built into the processor for increased throughput.

And 4 MB of RAM on 32-bit SIMMs with gold-plated connectors for greater reliability.

And 2 floppy drives.

Surprised? Keep reading.

You'll also get a 1024 x 768 14" color monitor with long persistence phosphors.

And the power to display 32,000 colors simultaneously, if you expand video memory to 1 MB.

And factory-installed MS-DOS® 5.0 and Microsoft Windows 3.0.

And a Microsoft Mouse.

And, considering it's from Dell, a whole lot of peace of mind.

That, by itself, is worth a fortune.



THE DELL 486P/20 20 MHz i486SX SYSTEM.*
SYSTEM INCLUDES 80 MB HARD DRIVE, SUPER VGA (1024 x 768) COLOR MONITOR,
5.25" 1.2 MB AND 3.5" 1.44 MB FLOPPY DRIVES AND 4 MB RAM.

SAVE \$248[▽]

MORE PRODUCTIVITY

The Dell 486D/25 is a sophisticated productivity workstation that was designed with your future in mind. To upgrade from a 25 MHz i486SX processor to a faster processor when available, all you'll need to do is replace a processor chip. Not a card. And starting with 4 MB, you can keep adding RAM up to a maximum of 64 MB.

This new system is priced on par with 33 MHz i386DX machines, yet performs up to 40% faster. And its sheer processing power is amply backed by a 100 MB hard drive with a 32 KB cache for increased throughput. A dual floppy drive completes the excellent storage arrangement.

A 1024 x 768 14" color monitor with a 70 Hz refresh rate gives you a flicker-free display. With 32,000 colors, if you make a small expansion of video RAM. Should anything go wrong, the built-in SmartVu™ diagnostic display can find the problem, even if the monitor goes down.

The 486D/25 comes with six expansion slots and five drive bays for added flexibility. You'll also get factory-loaded MS-DOS 5.0, Microsoft Windows 3.0 and a Microsoft Mouse.



THE DELL 486D/25 25 MHz i486SX SYSTEM.*
SYSTEM INCLUDES 100 MB HARD DRIVE, ULTRASCAN™ 14C MONITOR,
5.25" 1.2 MB AND 3.5" 1.44 MB FLOPPY DRIVES AND 4 MB RAM.

SAVE \$748[▽]

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Gold-plated SIMMs increase system reliability by eliminating connection-related errors.

There are plenty of companies anxious to sell i486 systems at a low price. All they really need is a supply of parts (the cheaper, the better) and a garage to assemble them in. Once the "production line" gets going, they place



The 486P120 is one of the few computers to feature 16 MB SIMMs.

At Dell, on the other hand, we offer lower prices by cutting down on traditional retailer mark-ups, not quality. In fact, we're almost fanatical about the quality of every machine that leaves our state-of-the-art factory. That attitude is reflected in the way we design, test, manufacture and ship our i486 systems.



Our Black Box test makes sure your Dell computer never arrives this way.

To see how our i486 systems stand up to air delivery, we use a Black Box. Or, in technical parlance, a portable accelerometer/thermometer. This little device is fitted into a test computer which we then send out through regular delivery channels, much as if you had ordered it yourself. When we bring it back, the "Black Box" tells us exactly what the computer went through, in terms of shock, vibration and temperature. This innovative test is part of a series that's been so

successful in helping us improve our packaging, we've won an international award for package design.

To make our computers more reliable, we cook them. After our computers are fully assembled and configured, randomly selected units are "burned-in" and tested at 104°F.

In perhaps the most grueling temperature test we've ever come up with, pilot Dell systems must survive a storage chamber where temperatures vary rapidly between -40°C and +60°C.

JUST BECAUSE YOU PAY LESS DOESN'T MEAN YOU GET LESS.

Our computers have a heart of gold.

At Dell, we take quality consciousness so seriously, we fit our i486 systems with SIMMs that have gold-plated connectors. If you're wondering what such expensive components are doing in relatively inexpensive computers, the answer is simple: they cost us a bit more, but by eliminating connection-related errors, they're worth their weight in gold.

It's exactly this kind of commitment to quality control that's enabled us to meet CSA, UL, TUV-GS, FCC and VDE standards, earning worldwide regulatory approvals.

There are thousands of ways to use a Dell i486 system. Dell i486 systems are tested for compatibility with major

peripherals, software applications, network topologies and network operating systems, including Banyan and Novell, in several hundred permutations per system. They're

even tested for AS-400 connectivity. So you can use our machines in virtually any environment.

50% fewer opportunities for things to go wrong. After the traditional computer manufacturer builds a system,

it goes to the dealer, who then does his own configuring. That's 2 stages of manufacturing, which means twice as many opportunities for things to go wrong.

A Dell i486 system, on the other hand, is manufactured only once. We custom-configure memory boards, network cards and advanced video, testing the system as a unit.

We even load select software packages you buy from us, at no cost to you. That includes MS-DOS 5.0, Microsoft Windows 3.0, and many popular applications programs.

With 20 diskettes and 2 hours to load and configure just one system, imagine the time you'll save and the potential hassles you'll avoid. Which gives you yet another reason to buy a Dell i486 system:

When you open the box, you're ready to go.



800-545-9670

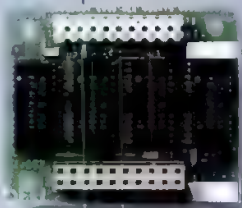
TO ORDER, CALL PLEASE REFERENCE #11802
HOURS: 7AM-9PM CT MON-FRI 8AM-4PM CT SAT 10AM-3PM CT SUN
IN CANADA 800-668-3021 IN MEXICO 95-800-010-0664

And if you think that's rough, consider our shock test. Sample i486 computers are strapped to a guillotine-like apparatus which repeatedly drops them to the

ground. This tells us what we can do to improve their shock tolerance level.

Our power supply units undergo an equally rigorous quality control process. In a test that simulates several years of actual usage, randomly selected test units are switched on and off 1,200 times; only then can they be approved.

While our testing may seem a little extreme, it's based on a rather simple fact: if our machines don't fail with us, they haven't much chance of failing with you, either.



A small expansion of video memory gives you over 32,000 colors for a near photographic quality display

WE THINK A COMPUTER SHOULD COME WITH MORE SUPPORT THAN THIS.

As a potential buyer, you'll receive lots of attention from most computer companies. Until they receive your check, that is. For all practical purposes, once the sale is closed, so is the company.

At Dell, on the other hand, half our story begins after you receive your computer. Despite our low prices, we've built a reputation for the highest level of support in the industry.

To begin with, a Dell expert works with you to figure out which computer, with which options, works best for you. We help you arrange financing from a wide variety of credit, lease and lease-to-buy plans. Then we test, pack and ship your

personalized personal computer to you via two-day air standard.

In the unlikely event that you have a problem with your computer, it won't last long. Our technical support staff solves 90% of reported problems over the phone. Usually in six minutes or less.

You can also get technical help 24 hours a day via our innovative TechFax™ line. Just dial up and detailed system information

will be automatically faxed back to you from the Dell Technical Library.

We even have a special section on CompuServe's PC vendor forum. So you can view other users'

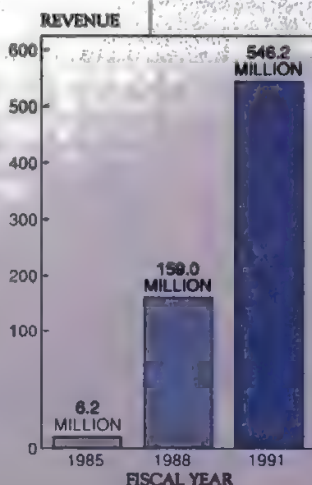
problems, and, more importantly, our solutions. But what makes our bulletin board special is that we constantly monitor what goes on there. Which means we can keep track of any small problems, and stop them before they become big ones.

But what if you have a problem that just can't be solved over the telephone?

On-site service is an ambiguous term.

To some enterprising vendors, it conveniently means that the replacement parts, and not the service technician, will arrive on-site. Which isn't as crazy as you may imagine; there are any number of do-it-yourself computer whiz kids in this business.

If you don't count yourself among their



Dell has built a \$546 million dollar business by building a relationship with every customer.

rankings, you'll prefer Dell's way of supporting our machines.

If needed, a trained technician can be at your home or office with a solution in hand, usually by the next business day.[△]

What's more, every time you call Dell Tech Support an entry is made in our customer database. So over time, we'll know your computer as well as you do. Maybe even better.

And you get all this support without getting

a bill. Because the price of your system includes on-site service coverage for a year, and phone support forever.

Buy a computer and get the company.

By standing firmly

behind every machine we've ever sold, we've built up a \$546 million company in just seven years, one customer at a time.

On the way, we've acquired quite a following. For example, the editors at PC Week have described the Dell service and support package as "overkill." J.D. Power and Associates[®] ranked Dell "Best PC in Customer Satisfaction in Small to Medium Sized Businesses."

We've won PC Week's Customer Satisfaction Roll an unprecedented eight times.

And in the last 12 months alone, we've collected 53 product awards, including PC Magazine's Editor's Choice, InfoWorld's Buyer's Insurance and PC World's Best Buy and World Class Awards.

And it's not just the smaller users that are satisfied, either: Dell computers are now used

by over two-thirds of the FORTUNE 500[®]. Overseas, it's been pretty much the

same story. We've more than doubled our overseas sales in the last 3 years in a row, and won in customer satisfaction surveys in the UK, Germany and France.

Still can't decide? Take 30 days to make up your mind. Within that time, if you aren't completely satisfied, just

return your Dell system and we'll refund your money, no questions asked.

We're proud to add, though, that this unconditional

guarantee has been used so sparingly, only 1.2% of the over half a million computers we've sold so far have ever come back.

What does keep coming back, in ever increasing numbers, are our customers. Over 70% of the people who buy a Dell computer buy another. That's perhaps the strongest statement of satisfaction any manufacturer could ever hope to receive.

So before you buy an i486 system, ask



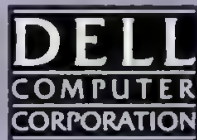
Every Dell Computer comes with a trained computer staff who knows your computer as well as you do. Maybe better.



Our 53 product awards in 1991 alone make Dell one of the most awarded PC companies in the world.

around; there are plenty of Dell users out there. And if there's anything you need, call us. But you'd better hurry.

Great computers may last a long time but great deals don't.



800-545-9670

TO ORDER, CALL PLEASE REFERENCE #11BQ2
HOURS 7AM-9PM CT MON-FRI 8AM-4PM CT SAT 10AM-3PM CT SUN
IN CANADA 800-668-3021 IN MEXICO 95-800-010-0664



Last year, Dell won customer satisfaction polls in the U.S., U.K., Germany and France

SEND US THE FAX AND WE'LL SEND YOU THE FIGURES.

Fill this out, fax it to us and we'll send back a price quote, spec sheet and any other information you may need on our line of i486 systems.

PROCESSOR

- ☐ i486SX, 20 MHz
☐ i486SX, 25 MHz
☐ i486, 33 MHz
☐ i486, 50 MHz

ARCHITECTURE

- ☐ EISA
☐ ISA

CHASSIS

- ☐ Small Footprint
☐ Mid-Size
☐ Floor-Standing

DISKETTE DRIVES

- ☐ 3.5"
☐ 5.25"

MEMORY

- ☐ 4 MB
☐ 8 MB
☐ 16 MB

HARD DRIVES

- ☐ 50 MB
☐ 80 MB
☐ 100 MB
☐ 200 MB
☐ 320 MB
☐ 650 MB
☐ Other

MONITORS

- ☐ VGA Color, 14", 640 x 480,
 .39mm dot pitch
☐ VGA Color Plus, 14",
 640 x 480, .31mm dot pitch

- ☐ Super VGA Color, 14",

1024 x 768, .28mm dot pitch

- ☐ UltraScan 14C, 14", 1024 x 768, .28mm
 dot pitch non-interlaced, 70Hz

- ☐ UltraScan 15C, 15", 1024 x 768, .28mm
 dot pitch non-interlaced, 70Hz

- ☐ GPD-16C, 16", 1280 x 1024, .31mm dot pitch

- ☐ GPD-19C, 19", 1280 x 1024, .31mm dot pitch

OPERATING SYSTEMS

- ☐ MS-DOS 3.3
☐ MS-DOS 4.01
☐ MS-DOS 5.0
☐ MS-OS/2 1.21
☐ Dell UNIX® System V

OTHER (i.e.: tape drive, network card,
 mouse or modem)

Name _____

Title _____

Company _____

(If Applicable)

Address _____

City _____ State _____ Zip _____

Fax Number _____

Please have a Dell representative call me at

() _____



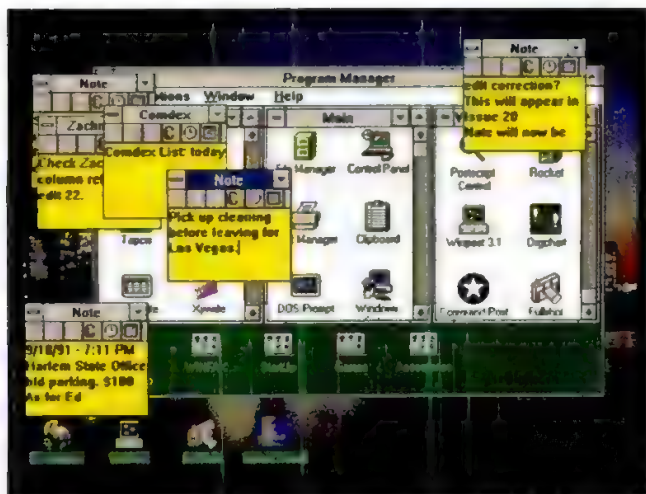
800-727-8320

EASTERN MOUNTAIN SOFTWARE

WINPOST 3.1A

BY JOEL DREYFUSS ■ Nobuya Higashiyama's *WinPost*, Version 3.1a, is based on one of those ideas that makes you say, "Now why didn't I think of that?"

The concept is simple: an electronic version of Post-it notes for Microsoft Windows. Others have tried to make it work, but Higashiyama's is the best implementation. He starts with the basic notes that you can stick anywhere on the screen, then builds features to create a clever application. He lets you create the notes easily, move them around, and hide them and



WinPost demonstrates the most flexible implementation yet of an electronic Post-it note program for Windows.

search them far more efficiently than you can manipulate the paper ones; here, at least, you know where they are. The default color is yellow, of course, but up to 14 other hues are available.

WinPost's triumph lies in its excellent implementation of the Windows interface. You click on the *WinPost* icon at the bottom of the screen to generate a new note. An icon bar across the top of each note (which you can suppress for simplicity) gives you one-click options to cut or paste text to and from your notes, stamp them with the date and time, or pop up a control panel with even more features. The panel lets you set alarms that will bring the note up at the right time and play a short tune, change the note size, or write a different title on each note. You can create groups of notes and hide them.

WinPost doesn't pretend to be a personal information manager, but its alarm and search functions may be all a lot of people need to track appointments and to-do lists. *WinPost*, Version 3.1a, is shareware, available on PC MagNet and on

bulletin boards. The conscientious author has been exemplary about squashing reported bugs and posting new versions.

FACT FILE *WinPost*, Version 3.1a; Eastern Mountain Software, P.O. Box 20178, Columbus, OH 43220; 614-798-0910. **List Price:** Shareware, available on PC MagNet and BBSs, \$30. **Requires:** Microsoft Windows 3.0. **Reviewed:** Not previously reviewed in *PC Magazine*.
CIRCLE 606 ON READER SERVICE CARD

SYMANTEC CORP.

ZORTECH C++ DEVELOPERS' EDITION, VERSION 3.0

BY KAARE CHRISTIAN ■ When compilers get better, favorite business applications are sure to follow. *Zortech C++ Developers' Edition*, sold by Symantec for \$699.95, breaks new ground by providing a swarm of top-notch development tools in a single box. You get both 16-bit and 32-bit versions of the compiler, plus 16-bit and 32-bit royalty-free DOS extenders. Before *Zortech*, using DOS extender technology was messy; you needed to assemble the development tools from several vendors and pay royalties for the extender. *Zortech* just said no to paying royalties to get past 640K, and to using different C compilers for 16- and 32-bit code generation. *Zortech*'s code generation technology is the best in the business.

Zortech also supplies a comprehensive Microsoft Windows development solution, including a help compiler, a resource compiler, and full documentation. One facility can recompile ordinary DOS programs to make them simple Windows applications. The only disappointment in *Zortech*'s Windows toolkit is Blue Sky Software Corp.'s embarrassingly nonfunctional *WindowsMaker* Prototyper.

Zortech also includes an OS/2 version. And C++ compliance has improved, with support for AT&T's IOSTREAM I/O library and more control over floating-point operations.

Remember Victor Kiam, who liked Remington razors so much that he bought the company? Symantec's Gordon Eubanks just did the same. *Zortech*'s tools currently don't lead the pack in ease of use; Borland International's C++ clearly takes that prize. But with Symantec's backing, *Zortech C++ Developers' Edition*, Version 3.0, should be able to address issues like ease of use while continuing to set the pace technically. ■

FACT FILE *Zortech C++ Developers' Edition*, Version 3.0; Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014; 800-441-7234, 408-253-9600. **List Price:** \$699.95. **Requires:** 10MB disk space, OS/2 1.x or DOS 3.3 or later. **Reviewed:** November 12, 1991, page 44.
CIRCLE 607 ON READER SERVICE CARD

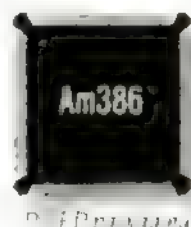


It's Also More Power

Introducing The 40MHz Am386™ Microprocessor— The Speediest 386 On The Planet.

It looks like a mild mannered 386. In fact, it is: A genuine, plug-in replacement for the i386. Except it's faster. Burns less power. Costs no more. And it's available now.

The Am386DX-40 microprocessor



can transform any ordinary 33MHz system into an invincible, 25% faster, 40MHz Am386 system. So you can easily offer the world's fastest 386 performance.

It's not only super-fast, it's also super-efficient, thanks to its truly static



ful Than A Locomotive.

operation. That means even notebooks and palmtops can attain breakthrough performance.

Best of all, the 40MHz Am386 microprocessor is available now, available to everyone, and available at surprisingly low prices. How's that for Truth, Justice and the American Way?

So find a phone booth and call AMD

at **1-800-222-9323**. And let the world's fastest 386 come to your rescue.

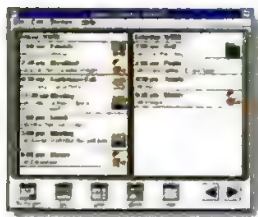
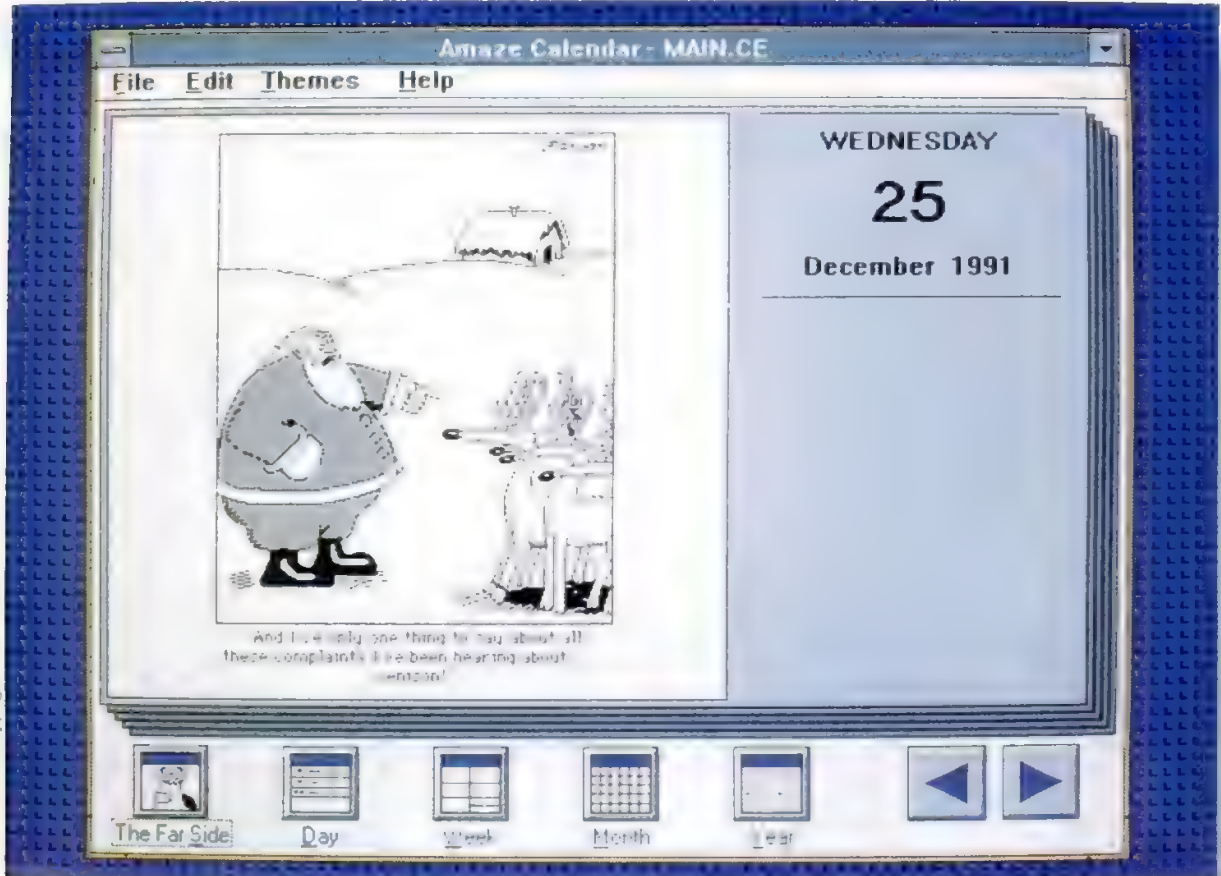


Advanced Micro Devices

"We're Not Your Competition."

Buy this software or the reindeer gets it.

The Far Side Copyright ©1980 Chronicle Features



This full-function desktop organizer lets you keep track of your business with animated reminder icons.



Animated Far Side characters will brighten your day by making random guest appearances.



Plan your schedule by the day, week, month or year and print any view in a variety of sizes.

Now your computer can take you to The Far Side with The Far Side Computer Calendar for only \$69.95. Visit your dealer or to order, call 1-800-367-4802.



amaze

© 1991 Amaze, Inc., All Rights Reserved

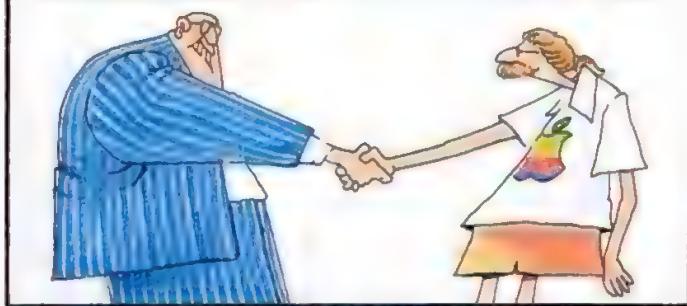
Abort, Retry, Fail?

SPECIAL EDITION

BY BILL HOWARD

PC Magazine salutes the more memorable moments of the last year and the highlights of the PC's first decade.

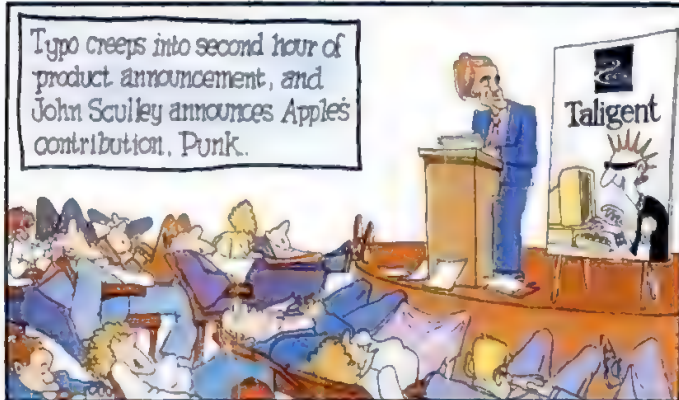
IBM and Apple agree to jointly develop an object-oriented operating system. Time to choose a catchy name...



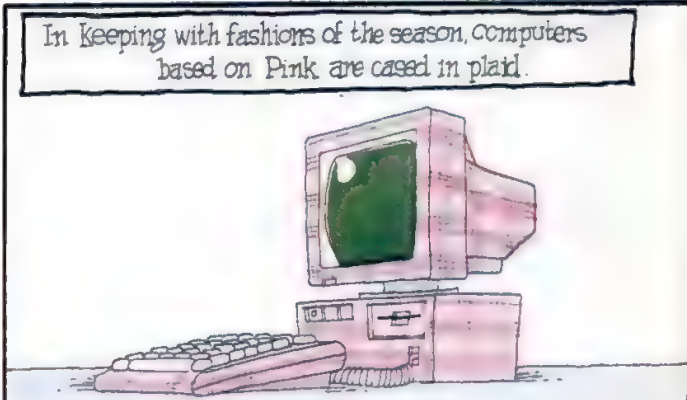
...all the good names (like "Allegis") are already taken. "Metaphor" suggests IBM control of partnership. "Patriot Partners" sounds too Gulf-War-ish.



Typo creeps into second hour of product announcement, and John Sculley announces Apple's contribution, Punk.

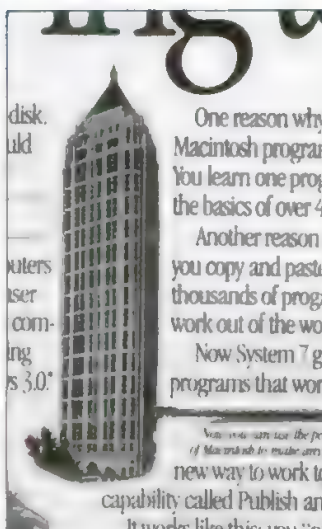


In keeping with fashions of the season, computers based on Pink are cased in plaid.



Greetings from the Planet of the Lost Infiniti Copywriters

"The symbol depicts ripples growing and interacting in a pool of water. It suggests the interaction of man and machine and the positive, harmonious, and far-reaching effects that this company is going to have on the world." —IBM-Apple's description of their new Taligent software group



The generic office building Apple chose for this System 7 advertisement happens to be the IBM Building in Atlanta.

B.O.T.Y. (Buzzword of the Year) Disambiguation dialog.

Translation: A dialog box that pops up when you need to choose between confusing alternatives. Perpetrator (there may be more than one, but we heard it there first): Pensoft.

In Case Disambiguation Dialog Cannot Serve:

B.O.T.Y. First Runner-Up Slipstream release. Translation: Running bug fix made without changing the version number, so the user doesn't know if the product he just bought is really the most up-to-date. Perpetrator: Lotus (with 1-2-3 for Windows).

B.O.T.Y. Second Runner-Up In-built.

Translation: Built-in. Perpetrator: Sharp.



Fame so fleeting: The \$2,000 Airis 286 laptop earned the cover of Byte magazine and a glowing review in May 1990. Too bad it never really shipped.

Abort, Retry, Fail?

SPECIAL EDITION

We're from the Government and We're Here to Help You

The U.S. Commerce Department imposed a 62 percent tariff on high-end (active-matrix) flat-panel displays imported into the U.S., in order to protect America's embattled flat-panel manufacturers. However, panels made here aren't the kind that appeal to laptop makers.

At the same time, the government ended its 100 percent tariff on laptops assembled in Japan. Our government figured the Japanese had too much invested in U.S. facilities to move assembly back offshore. Said the manager of one top-five laptop maker, "It took us one day to make arrangements to move production offshore."

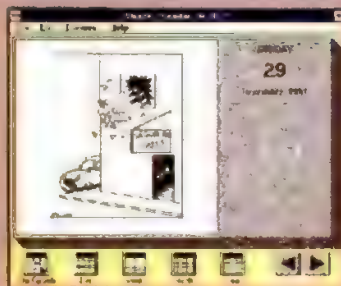


Rambo, here's your printer: Ad for Star Micronics in *PC Week Asia*.

If This Bill Passes, New Jersey's a Goner as America's Software Development Center

New Jersey legislators submitted a bill requiring the licensing of software designers.

Since PC-based calendar programs don't work very well as a rule, at least they ought to be fun. Our favorite: *The Far Side Computer Calendar* from Amaze Inc. (\$69.95, 206-820-7007).



Tortoise-and-Hare ("All It Needs Is a Faster Video Card") Tortoise Award

Winner (and it wasn't even close):

- Symantec Corp.'s *The Norton Desktop* for Windows

Runners-up:

- Lotus 1-2-3 for

Windows

- Ashlar's *Vellum*

- Symantec Corp.'s *On Target*

- Anything from Microsoft

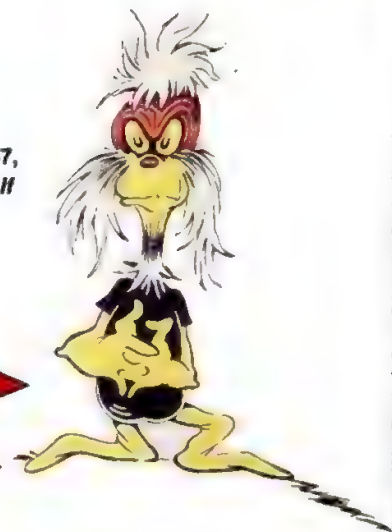


What's he doing with his arms folded? Waiting for *The Norton Desktop* to load.

Aim at the Dot (But Don't Get the Screen Wet, Please!)

The workers didn't like the urine method, so defense contractors came up with a new wrinkle to test for drug abuse: a computer-based video game that measures impairment. Each morning, the worker must position a dot at the center of a computer screen. Failure to match the previous day's performance gets the worker sent home for the day.

RIP: Theodor Seuss Geisel, 87, creator of the term "nerd" in *I Ran the Zoo* back in 1950.



The Microprocessor As a Powerful Tool for Social Change and a Better Life for Us All

10,000 Minnesota residents were to be able to play the state lottery from home using modified Nintendo systems.

And While Running as A Background Task, It Picks Your Minnesota Lottery Number

IBM will sell PS/1s with OS/2 2.0 installed.

Unique Names of 1991

Comdex at Spring and **Windows World at Spring**, the new names for Spring Comdex, the smaller (by far) of the year's two Interface Group computer dealers' expositions. Most everyone quickly shortened it to WinDex.

Winvoice. No, not a multimedia voice module, but an invoice program that runs under Windows.

Windease. A Windows tutorial. What, you thought it prevented gas?



Last year was the year of the magazine and newspaper profile of Bill Gates. This year: the year of the unauthorized Bill Gates bio book. If you haven't been keeping track: he's 36 years old now; his Porsche 959 hasn't been made legal in the U.S. yet; high-tech multimedia house just under way (Hearst Castle meets *Starship Enterprise*?); up to No. 2 on the list of wealthiest Americans. Meanwhile, hometown press, getting wind of the national-media Gates obsession, rushes to profile him. *The Seattle Post-Intelligencer* declares his birthday to be October 27, 1955, and compiles a horoscope: "Aggressive and stimulated by conflict; tends to change moods quickly, going from calm to anger and from politeness . . . to rudeness . . . [gains] respect rather than affection from others." Actually, this Scorpio was born October 28. But then what Microsoft product ships on time?

Abort, Retry, Fail?

SPECIAL EDITION

If the industry put as much inspiration into real software as it did into screen blankers, the world would be a better, more productive place.



Is this for here or to go? Borland's C++ and Application Frameworks weighs 15 pounds and has a built-in handle.

Three Big Lies:

1. The minimum you need to run a multimedia PC is a 10-MHz 286 with 2MB of RAM and a 30MB hard disk.
2. The minimum you need to run Microsoft Windows 3.0 is 1MB of RAM.
3. The minimum you need to run Microsoft Windows 3.0 is 2MB of RAM.

Joke of the Year

Q: What do you get when you cross Apple with IBM?
A: IBM.

Most Self-Inflicted Wounds

Prodigy Interactive Personal Service

And All Along Everyone Thought It Was a Programmer in Need of a Long Shower

Pennsylvania College of Technology quarantined \$400,000 worth of foul-smelling new computers donated by IBM, fearing they had been contaminated by toxic chemicals. Nothing so dangerous: The truck carrying the computers also carried a leaky shipment containing concentrated oil of garlic.

Acer's rose-scented ad in our November 13 and December 11, 1990, issues incensed more than a few readers. That was the first and last time *PC Magazine* smelled like a department store mailing.



Spare Us, Please, From Noun-Verbs

interface
architect
productize

We Wouldn't Think To Argue

"There is a widespread belief that PostScript is slow."
—Adobe Systems press release



Taste is in the eyes of the beholder, and the *Whereabouts* screen message board from Mouse Artist Software (508-485-9530) says worlds about your taste and your whereabouts when you're away from your desk.



The hottest Compaq yet: In Kuala Lumpur, Compaq is the name of a smokeless charcoal briquette, according to the *New Sunday Times* newspaper.

Chutzpah Award

1991 was another year for the privatization of the English language by the trademark office. It works this way: Take a pair of common English words, close up the spacing, add a capital letter somewhere, and you've got a trademarked name. Microsoft laid claim to "Toolbar," Lotus to "SmartIcon." And Cambridge Communications Associates says it owns the phrase "cross tabs," or more properly "Crosstabs." Previously, NEC's laptop division laid legal claim to the phrase "docking station."

Abort, Retry, Fail?

SPECIAL EDITION

DECADE of the PC

The PC turned 10 last year. Herewith, an *Abort, Retry, Fail?* Special Edition special appreciation.

Heaven's Gate—Ishtar—Hudson Hawk Products of the Decade

- CalcStar and DataStar
- Cassette data storage
- Chart Master
- Coleco Adam
- Columbia Computers
- Computer Devices DOT
- Context MBA
- Convergent Technologies Workslate
- CP/M 86



PCjr was proof people wanted to pay less for computers. They just didn't want to get less computer.

- Datavue Snap 1+1
- DEC Rainbow
- Dynabook
- Eagle Computers
- Easy
- Easy Writer
- Friday
- IBM XT 286
- Intel Visual Edge
- Ize
- Jazz
- Lisa
- Lotus Signal
- OS/2
- OS/2 SDK
- Ovation
- Parallel port copy protection plugs
- PC Convertible
- PCjr

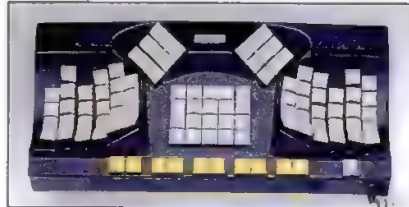
- Professional Graphics Adapter
- Smartcom II
- Sprint
- Stringy Floppy
- TeleCompaq
- Top View
- Turbo Lightning
- UCSD P-System
- Victor 9000
- Waterloo Port
- Zenith MinisPort
- Wacko alternate input devices: Cauzin Softstrip, Felix, Maltrom keyboard, Lenipen, HP-150 Touchscreen, foot mouse, head mouse

An Andy Warhol (15 Minutes . . .) Tip of the Little Tramp's Hat to . . .

- 2.5-inch floppy disk drives
- Apple's campaign to make us pronounce SCSI *sexy*, not *scuzzy* or *scussy*.
- Baby Blue card
- Chocolate floppy disks
- CP/M companies that tried to build MS-DOS PCs
- Custer's Revenge
- Floppy disk capacity-doubler punches
- Floppy disk drive dust covers
- IBM Desktop Software
- Intel's No 286s campaign
- JIVE
- Timothy Leary and Mind Mirror
- Human Edge Software and Mind Prober
- Mac Playmate
- Ribbon re-inkers
- Team Xerox

Forgotten But Not Gone . . .

- Ability, Enable, Framework, Symphony
- ADA
- Adam Osborne



Ergonomic, quite possibly; weird, undoubtedly: the Maltrom keyboard.

- CaPSL
- DeskMate
- DisplayWrite
- Eliza
- GEM
- Micro Channel clones
- Modula 2
- Robert T. Morris, Jr.
- MultiMate
- Peter McWilliams
- NEC UltraLite
- THOR
- Wang Freestyle

Word Most Corrupted By the Mainstream Press in the Eighties

hacker

Joke of the Decade

Q: What's the difference between a computer salesman and a used car salesman?

A: The used car salesman knows when he's lying.

Worst Prediction

Steve Ballmer, Microsoft vice president for systems software, June 1987: "We expect OS/2 to be the mainstream operating system for the desktop in two, two and a half years."

Flop Category Of the Eighties

personal information managers



Mea culpa—our best self-inflicted wound: The misspelled cover of the January 17, 1989, issue.

Harvard B-School Case Studies For the Ages

WINNER

Ashton-Tate. Back-to-back purchases of about-to-tumble Connecticut software companies (Softword Systems, Decision Resources) and their Bronze Age programs (MultiMate, Chart Master) plus the dBASE IV bug fiasco. Not to mention *Friday*, Byline, and Rapid Fail. They teach more business sense at Hamburger U.

HONORABLE MENTION

Businessland: Nice move: Alienate Compaq so it goes elsewhere, then decide you can make up the lost revenue peddling NeXT machines.

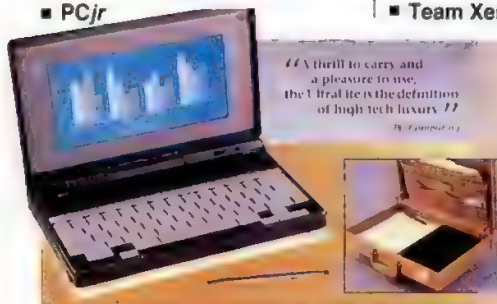
Digital Research: Okay, so Kildall wasn't out flying a plane when IBM came looking for an operating system. But just think, Gary: You could be worth \$5 billion instead of him.

Micropro: Three years to upgrade WordStar? You're lucky the company's still alive.

VisiCorp: Didn't you folks own the spreadsheet market at the turn of the decade?

Straight from the Sharper Image Catalog to the PC Magazine Hall of Fame Puma's \$200 RS Computer Shoe with a serial port in the heel. You could upload information to your PC on how far you ran each day.

Contributors to ARF Special Edition: Johan Mokhtar (Compaq charcoal), Robert Whiteman (Damark catalog), Judi Kaufman (garlic computers), Julius Espinosa (Star Micronics). Special thanks to Barry Simon, John C. Dvorak, Bill Machrone, Michael Miller, Frank J. Derfler, Jr., Gus Venditto, Edward Mendelson, and William F. Zachmann.



The \$699 NEC UltraLite Breakthrough!

It was a great concept, it won our Tech Ex award, but it didn't have a floppy disk drive and it didn't hold up too well. Now it's a DAK catalog closeout.

THUMBS UP, THUMBS DOWN

In the PC industry, a year older isn't always a year wiser.

PC Magazine columnist Jim Seymour honors the notable winners and losers.

by Jim Seymour

Who says the PC business is getting boring? Just because Intel is shipping chips that make no sense, Compaq is going through a midlife crisis, and Microsoft is discovering that a decade of playing bully-boy leaves hard feelings among your little friends on the playground, where did you get the idea that this business is... ummm... maturing?

Signs of maturity—not to mention ossification—may be evident as too many PC vendors shift their focus from product strategies to distribution strategies, or take that courageous step of pruning some of the fat out of highly imaginary MSRPs (Manufacturer's Suggested Retail Prices). But as long as we've got people and companies like these around, we're still in the PC business, Toto.

 Thumbs Up to Digital Research for breaking the DOS doldrums. If these guys hadn't kept plugging away, Microsoft would still be resting on its laurels. (Maybe Manzi & Co. could also leave a wake-up call for Mr. Gates...?) Nice deal with Novell, too.

 The fool-me-twice, shame-on-me Thumbs Down award to Michael Shane for pulling out of yet another PC company. Model American's comet shone brightly, if briefly, mainly in its own ads in *The Wall Street Journal*. Back when Shane did this the first time, with Leading Edge, he used to say he wondered why people wanted to buy computers from him, because he might not be in the business very long. Michael, we're learning.

 Thumbs Down: The PC business has seen a lot of not-yet-ready-for-prime-time product nonintroductions, but this year's Constellation introduction may have retired the trophy. It consisted in its entirety of a piece of *MacroMind Director* animation, with a cute sailing motif. You remember Constellation; it was what the IBM/Metaphor Systems "Patriot Partners" project was called after they thought "Patriot"

carried too many Iraqi-war connotations—but before IBM discovered Apple's Pink Armonk's Operating System of the Month Club rolls on....

 Thumbs Up to IBM and Compaq for slashing prices. Thumbs Down for not cutting them enough to matter.

 Thumbs Down to Apple's John Sculley, with a Tin Ear Citation for 1991's best "Was he listening to what he was saying?" episode. At an industry-insider conference not long before IBM and Apple pledged their love in early October, Johnny and his new buddy "Jimmy" Cannavino went on about how there hasn't been any innovation in software in years. Hmmm... Do these guys actually use their PCs...?

 The 1991 Dawn's Early Tripe Thumbs Down Award to Jim Manzi and Lotus, for holding at that same conference a 6:30 A.M. press conference with IBM and Apple. World War III? The Second Coming? Nope. They just wanted to say that IBM and Apple sure do like *Lotus 1-2-3's* messaging interface, and therefore it is now the standard. Thanks, guys, and next time just slip a note under the door.

 The 1991 Thumbs Down and Why Bother Award to Microsoft, for putting together the Multimedia PC (MPC) standard, charging companies a zillion bucks to use the MPC logo on their products—then handing the whole thing over to the SPA to administer.

 The 1991 Thumbs Down and Why Bother Award II to Microsoft, for endlessly hyping the TrueImage page-description language, signing up printer makers to produce TrueImage machines—then handing the administration of the whole thing over to LaserMaster, a printer maker and thus competitor to all the other licensees involved.

 Thumbs Up to Borland (we think) for finally putting Ashton-Tate out of its misery, and (we're sure) for then quickly affirming its support for both *dBASE* and *Paradox*. Whew, that was a close one. Otherwise, by this time next year we'd all be using FoxPro 2.0....

 Thumbs Up to Symantec Corp. and *The Norton Desktop* for Windows for showing us how Windows should work. Now if only they could speed it up....

 Thumbs Down to Fran Tarkenton and his CASE company down in Atlanta, Knowledgeware. When they announced in late fall that they'd had a quarter with only half the revenue they'd predicted, a spokesman told reporters the company was "shocked," and that the company "had been unaware of its revenue problems until it added up sales figures on Tuesday." Wall Street knocked the stock down 28 percentage points the next day. Only 28 percent? Not to worry: As a Minnesota Viking, Fran was always a great scrambler. Our advice: Go short, boy. And maybe Fran should attend one of those success seminars he's always plugging on late-night TV.

 Thumb Kind of Mistake, Huh? Intel's 386SL doesn't really save much power, is next to impossible to use, but effectively prevents designers from using other vendors' controller and memory manager chip sets. This is the kind of progressive thinking that put Intel into our Big Thumb finals this year.

 Thumbs Down Again. Then there was Intel's 50-MHz 486 debacle. Hey, Andy: Any truth to the rumor that it really does work, but Intel held it up as a courtesy to Compaq, who can't make the Systempro play at 50 MHz without redesigning the motherboard from the ground up? Just thought we'd ask....

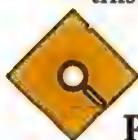
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PC **MAGAZINE** **BASIC** Techniques and Utilities • by *Ethan Winer*

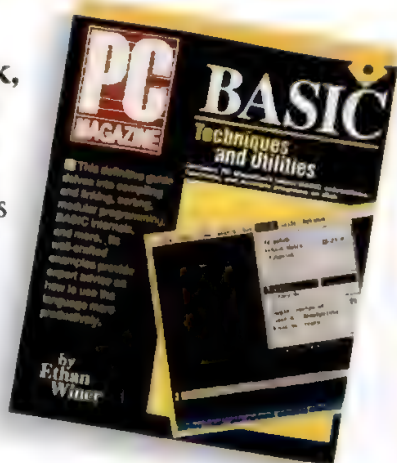
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THUMBS UP, THUMBS DOWN

(CONTINUED)



Three Thumbs and You're Out. A giant thumbs down for the 486SX chip, complete with no-go performance and a dead FPU. And for the now-you-see-it, now-you-don't design of the 487SX.



Thumbs Up to the *After Dark* screen blanker. If there's one thing the PC industry really needed this year, it was flying toasters.



Thumb Enchanted Evening: Jim Manzi thinks he can set messaging standards. Must be that huge *Notes* installed base. . .



Things That Go Thumb in the Night: The ACE Initiative. If these guys were all reading from the same script, it would be positively scary. What's their target—Sun? Mainframes? Minicomputers? Cheap clones? Sagging margins? Their own feet?



Thumbs Down to Lotus for shipping *1-2-3 for Windows* software before it was ready. Ditto to Central Point for doing the same thing with *PC Tools*. Ditto to WordPerfect Corp. for *WordPerfect for Windows*.



Thumbs Up to ATI Technologies for doing video right: 8514 better than IBM with the 8514/Ultra, Super VGA better than anyone with VGA Wonder Plus, and coming soon to a PC near you: ATI multimedia with Wonder Plus sound. Canadian PC companies have a lot on the ball (though the memory of Waterloo Port casts a long shadow . . .); ATI Technologies may be the best and brightest.



Thumbs Down to Compaq for abandoning its leadership role, and jumping on the upgrade—sorry, "modular"—wagon without anything to add. And half a thumb up for grudgingly offering Super VGA—at 16 colors. This isn't the Compaq we knew and loved. Sniff.



Thumbs Up to Hewlett-Packard for consistently improving already popular products, thereby obsoleting its own market-leading hits—but also buying the best kind of protection against the competition. This year's examples: the IIIP and IIISi printers, and the color ScanJet.



Thumbs Up to Peter Norton, who doesn't seem to do much anymore—but remains prominent in ads, packaging, etc. We're all quite envious. Really.



The No-Doz Thumbs Up Award to Toshiba for finally waking from its slumber with a slew of new laptops. What happened there, guys? Didja just nod off for a year or two?



The 1991 Thumbs Down Moral Dilemma: Is it true that some antivirus software vendors pay rewards and bounties to people who send in viruses they've "discovered"? Could it be that some of these people are actually writing the viruses and then selling them to the software vendors? Does that smack of sustaining the market for your products at the cost of your customers' best interests? Just asking. . .



The William Safire Memorial Thumbs Down, to the U.S. Postal Service for its mid-1991 proposal that we change the grammatical rules for addresses so their scanners could read envelopes more easily. Isn't this backward? Shouldn't the post office get scanners that read grammatically correct English? Silly idea, I know.



Thumbs Up to cool CD-ROMs like *Mammals: A Multimedia Encyclopedia* and especially *Multimedia Beethoven*. We have seen the future, and it's in digital stereo.



Thumbs Up to AMD and Chips & Technologies, for both the engineering savvy and the business chutzpah to develop 80386 clones.

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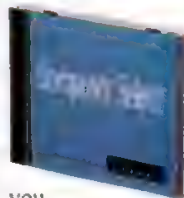
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CIRCLE 378 ON READER SERVICE CARD

386/40 PCs

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While many manufacturers wait on the sidelines, 15 vendors have produced the industry's fastest 386-based computers. But surprise! The computer inside comes from Advanced Micro Devices.

Advanced Micro Devices wants to be where "The Computer Inside" is. We can think of AMD's production of high-speed 386 microprocessors as an admirable if somewhat futile challenge to a seemingly omnipotent corporate entity. Or we can simply view it as a David and Goliath story and get vicarious thrills seeing Mr. Big Stuff knocked down a bit. However you take it, AMD's move on Intel Corp.'s turf is a classic piece of marketplace Americana. **by Greg Pastrick**



IN THIS REVIEW

ACMA 386/40
Amax PC/386-40
Arche Legacy 386-40
Ares 386/40 Sonic
Club Falcon 386/40
CyberMax 386/40
Eltech Model 3400
Hyundai Corporate Series 386/40

Intelec INT 386-40
Micro Express ME 386-40
National Micro Systems
Flash 386-40C
Northgate Slimline SP 386/40
PC Brand 386/40 Cache System
SST 386-40MWC
Tangent Model 340

Intel's legal dispute with the Austin, Texas-based AMD over infringement of microcode has captured considerable attention during the past year. AMD cites a 1976 agreement, which the company says allows it to copy and incorporate Intel's microcode into AMD's version of the 80287 math coprocessor. Intel says AMD may have the right to use that microcode for product development, but it cannot distribute the code. Still, AMD has wasted no time waiting for the gavel to fall. The company has gone straight to the heart of the market by producing a competing line of 386s, including 40-MHz 386DX and 25-MHz 386SX microprocessors, and these PCs show no signs of incompatibility. Intel once again has filed suit, and this time a decision in Intel's favor could force AMD to recall its product.

Legal matters aside, AMD's threat is real to the high end of Intel's 386 line and the low end of the 486 line, too. The performance figures on AMD's Am386 alone begin to tell the tale. AMD's chip completes our processor tests in 15 percent less time than the Intel 386/33 and an impressive 25 percent less time than the 486SX/20.

AMD touts several other advantages over Intel's chips. From a technology standpoint, the 386/40's static design allows the chip to be clocked downward from its maximum operating speed all the way to 0. (Intel will also ship low-power CPUs in its 16-, 20-, and 25-MHz 486SX lines and its 25-MHz 486DX lines.) In addition, AMD is making the chip available in flat surface-mount and PGA packages. Both these features make the chip appealing for portable-PC makers: Low clock speeds can save battery power, and flat packages take up less space.

From a marketing standpoint, the AMD chip obviously poses an opportunity to first-time manufacturers who don't have a line of Intel processors. What's more, AMD's 386/40 chip brings manufactur-

ers who make a business out of offering versatile upgrade paths a chip with performance benefits that truly bridge the gap between 386 and 486 computing.

AMD's pricing holds some benefits as well. The company's 1991 Am386 fourth-quarter price, for 1,000-unit quantities, is \$190; Intel's price is \$195 for the 386/33. Intel quotes \$242 for its

486SX/20 in 1,000-unit quantities.

Intel has hardly remained idle during the past year. New chip samplings, enhanced 486 chip releases, product announcements, and record profit reports are just some of the company highlights from the past six months. Intel has all but abandoned development of its own 386DX line. Instead, the company is growing its

OUR CONTRIBUTORS

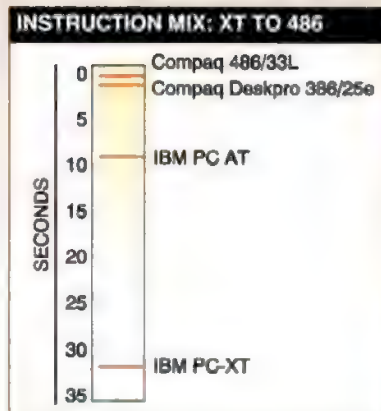
Bruce Brown is a contributing editor of *PC Magazine*. Kellyn Betts, Joseph Desposito, Patrick Honan, Greg Pastrick, John R. Quain, and Tom Unger are frequent contributors to *PC Magazine*.



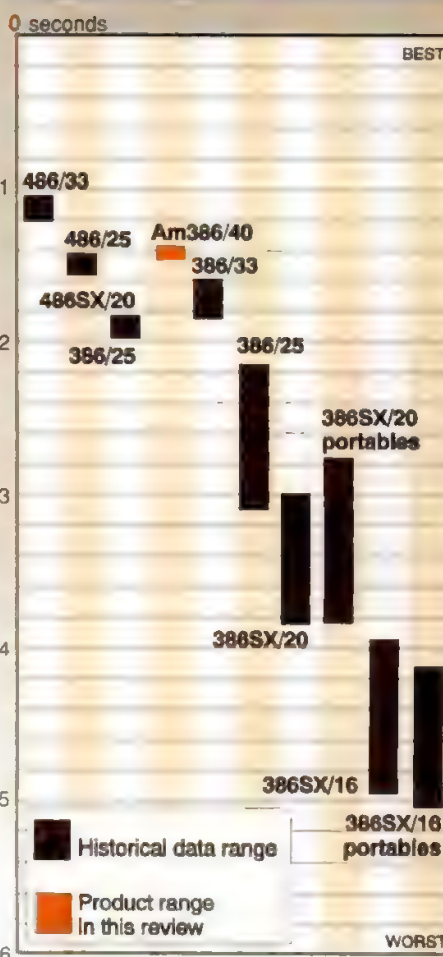
PROCESSOR PERFORMANCE COMPARED

These 15 systems, which use Advanced Micro Devices' 40-MHz Am386 chip, showed better performance than almost all Intel 386/33 and 486SX/20 PCs tested by PC Magazine Labs over the past two years. The systems even showed marginally faster processor performance than some 486/25s.

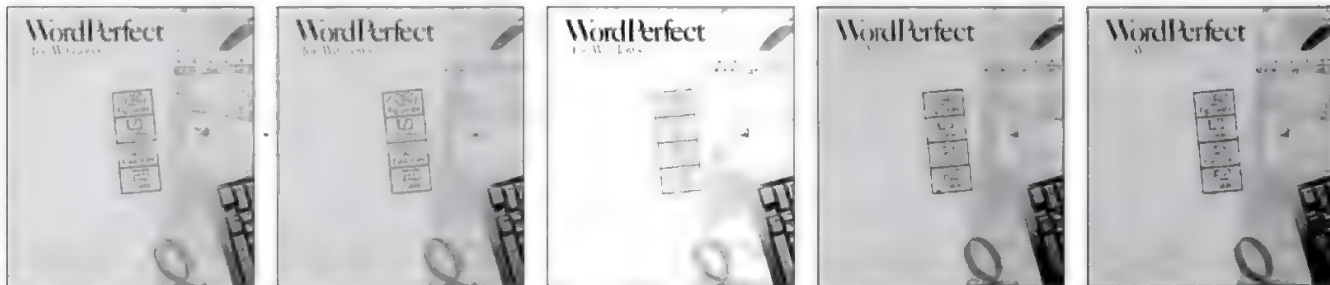
The large chart, right, shows the range of Instruction Mix benchmark test scores, from fastest to slowest, for PCs tested by PC Magazine Labs over the past two years. The chart below shows the average Instruction Mix scores for the Compaq Deskpro 386/25e, the Compaq 486/33L, the IBM PC AT, and the IBM PC-XT. (These figures have a 0.05-second margin of error.)



INSTRUCTION MIX SCORES: 386SX TO 486



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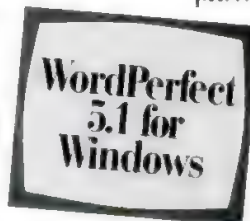
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486 line with such new products as 5-volt and 3.3-volt 486SXs, in 16-, 20-, and 25-MHz flavors, and new clock-doubling chips that will give Intel 486 products one advantage that AMD's 386 chips don't have: upgrade potential.

Intel's clock-doubler processor introductions, which will be produced in 1992 for 16-, 20-, and 25-MHz 486SX chips, will plug into an open coprocessor socket on a 486SX or DX motherboard. With a 40-MHz clock doubler, for example, the chip will run at 20 MHz externally but at 40 MHz internally. The result is greater processor performance. If doubling the 486SX processor performance catches on, you can be sure similar processors will be available for 25- and 33-MHz 486DXs.

Of course, if rumors prove true, AMD will bypass that whole mess by introducing a high-speed 486 processor after the first of the year.

All this is fine background, but the real reason for this story is to see how the Am386/40 measures up to Intel's standards. We were able to find 15 manufacturers who were up to the challenge. Though few direct-market manufacturers and no major retail names are among them, that will not be the case for long. Already there is interest in AMD's microprocessors for portable PCs. AST, Everex, GRiD, and Olivetti have announced plans for producing notebook computers using AMD chips.

ACMA, Amax, Arche, Ares, Club, CyberMax, Eltech, Hyundai, Intelec, Micro Express, National Micro Systems, Northgate, PC Brand, Sirius, and Tangent sent us systems with 8MB of RAM, an external processor RAM cache if available, a 200MB hard disk, two high-density floppy disk drives, a Super VGA display and video card, and DOS 5.0. BlueStar, C² Microsystems, Dataworld, International Instrumentation, LANtex, MultiMicro, Spear Technology, Standard Computer Corp., Sureman, and United Micro Systems said they are selling such systems, but they could not ship us production units in time to meet our deadline. We dropped a system from newcomer V-Three when we learned that the company was reselling an Arche system and planned to discontinue that model.

Pricing on the systems ranges from \$1,975, for National Micro Systems' Flash 386-40C, to the \$5,602 Arche Legacy 386-40. The average price for all the Am386-based systems is about \$3,200, though a wide variety of systems are

PRICE/PERFORMANCE INDEX: Am386-BASED PCs

Sirius's SST 386-40MWC gives the buyer excellent bang for the buck: slightly shy of the Arche Legacy 386-40's top performance and features score, but at a savings of more than \$2,000. Penny-pinchers will look at the National Micro and the CyberMax 386/40 Systems Flash 386-40C; both break the \$2,000 barrier and are decent performers.

The best 486SX/20 beat only 5 of the 15 386/40s in terms of performance and features. Between the AMD Am386 chip's higher speeds and the extras that some of the lesser-known vendors threw into their systems, the Am386-based machines give plenty of bang for the buck.

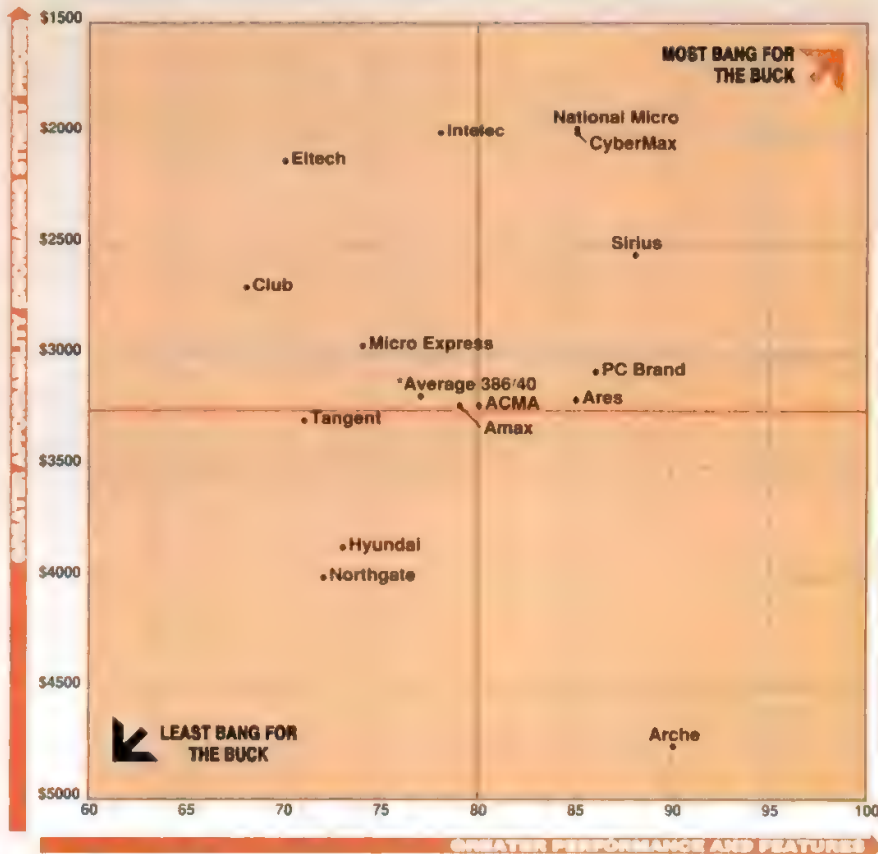
The best all-round value: Sirius's PC, followed closely by the National Micro and CyberMax systems, whose sub-\$2,000 prices make up for minor shortcomings in features and performance.

The Northgate, Hyundai, and Tangent systems proved a disappointment in terms of sheer value, though they come with somewhat more familiar names. The three were not only pricier than average, they scored on the low side of the performance and features range. These systems, as well as those from Ares, Club, Eltech, and Micro Express, faltered on PC Magazine Labs' memory benchmark test.

THE DATA POINTS

The performance/features axis of the Bang for the Buck chart is based on ten data points: the four benchmark test scores, installed RAM, disk capacity, VGA RAM, free slots, drive bays, and extras (miscellaneous items such as free bundled software, mouse, on-site service, FCC Class B certification, extended warranty policy, and flash EEPROM). A set of weighting factors has been applied to the raw numbers; you can find this data in the Software Library of PC MagNet's Editorial Forum as 01BANG.WK1.

Location on the y-axis is based on each system's tested-configuration price (as listed in the fact file). We applied a 15 percent discount to the list prices of dealer-distributed systems to approximate street prices.

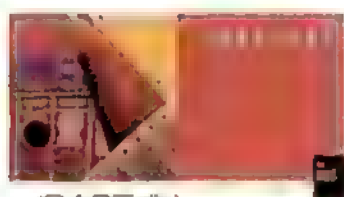


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COMPUTERS

40-MHz AM386-BASED PCs

available for less than \$3,000. By comparison, average pricing for similarly configured 486SX/20 systems reviewed in the December 31, 1991, issue of *PC Magazine* was more than \$4,500.

Since both AMD and Intel see the 386/40 as direct competition for the 386/33 and 486SX/20, a good measure of how they compare is found in the collected data on our processor test for machines running under each microprocessor. In terms of raw computing power, the numbers recorded by the AMD chip are impressive. The Am386/40 completed our processor test, on the average, in 25 percent less time than the 486SX/20, and in 16 percent less time than the 386/33. Specifically, the 386/40s took an average 1.40 seconds on our processor test, and the average compiled for the most recent group of identically configured 486SX/20s was 1.86 seconds on the same test. The historical average for the 100 33-MHz 386s tested by PC Magazine Labs over the past two years was 1.67 seconds.

So what does this mean for the here and now? The plain fact is you are sure to see a performance advantage over 386/33 and 486SX/20 systems from any machine based on the 40-MHz Am386. As always, the shakeout among the units packing the AMD processor comes down to a buying decision based on an analysis of key features and functions. Many of these 386/40s share common components that perform consistently, regardless of the platform; most often, in both CPU categories, vendors shipped Tseng chip-based video subsystems and fast Western Digital Piranha 4200 hard disks. The biggest difference between the two categories is the names of the system vendors.

Emphasis on video performance seems to be a common thread among the manufacturers represented in this test group. Almost all of the vendors in this group put together display systems with 1MB of video RAM; Tangent's Super VGA board

even came with a graphics accelerator chip set installed on the card. In general, we found that video performance was greatly improved by the Am386's faster clock speed. Our test of the upgradable Hyundai Corporate Series 386/40 illustrates this point. When we replaced the Hyundai system's 486SX/20 processor card with a 386/40 processor card, this PC's 1.98-second video time dropped to 0.99 seconds. Only the processor was changed—nothing else.

Disk test times were much more closely matched between the 386/40 and 486SX/20 categories; the processor had little effect, if we again judge by the Hyundai system's admittedly sluggish Conner IDE disk, whose test scores under the two different processor cards remained within roughly 0.5 seconds of each other.

The vendors in this group also seemed more willing to bundle some software with their packages. We required DOS 5.0 to be installed, but many manufacturers supplied Microsoft Windows 3.0 and



SYSTEM CONFIGURATION AND PERFORMANCE: A GUIDE TO THE GRAPHICS

BENCHMARK TESTS

The Bars

These charts show each product's scores on four tests relative to the best, worst, and average scores of the products in this review. Each colored bar represents the range of test scores for the 40-MHz Am386 systems, from fastest to slowest. The longer the bar, the wider the range. If the best score is more than twice as fast as average, an upward-pointing arrow appears atop the colored bar.

A black arrow on each bar represents the given system's position relative to the historical range. The higher the arrow, the better the performance. If a system performs more than twice as fast as average, the black arrow appears at the top of the bar, pointing upwards.

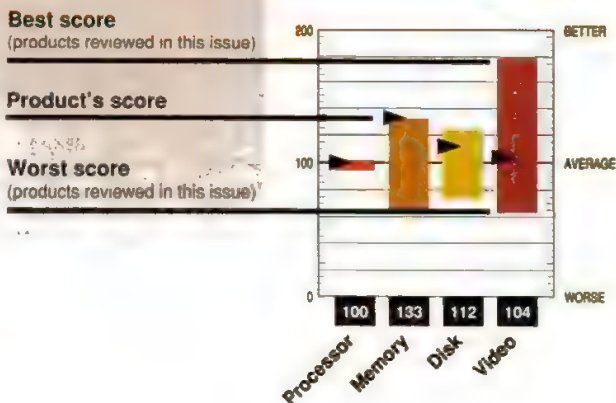
The Boxes

A normalized score appears in the box below each colored bar. To derive this figure, we calculated the average score for all 40-MHz Am386 systems tested and reviewed in this issue. We then divided this average by the score of each machine in turn and multiplied by 100.

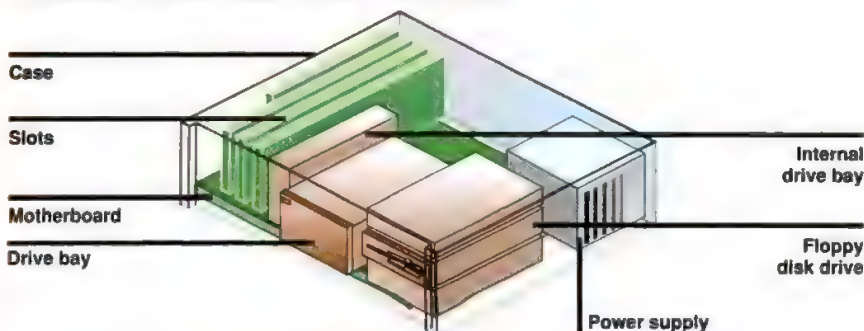
Thus the average score is 100; a number greater than 200 indicates that a system performed the test in less than half the average time; a number smaller than 50 indicates that the system took more than twice as long to complete the test.

A table of actual scores accompanies the three-dimensional bar charts.

TEST RESULTS



INTERIOR CONFIGURATION DIAGRAM



Case Options include desktop, tower, mini-tower, small-footprint, and slimline.

Slots The number and length of cards represent the number and length of slots on the motherboard.

Drive bay A hard disk face plate indicates external access to a bay. Options include full-height, half-height, third-height, and 3.5-inch.

Floppy disk drive A face plate indicates that either a 1.2MB or 1.44MB floppy disk drive was installed in our tested system.

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■ Tangent Model 340

Neither the flashiest performer on our benchmark tests nor anywhere near the cheapest system of the lot, the \$3,295 Tangent Model 340 is still the PC to choose if you need a great desktop-publishing or CAD machine. Its score on PC Magazine Labs' video test does not reflect the capabilities of Tangent's coprocessed S3 GUI accelerator, a high-color Sierra RAMDAC, and a flicker-free 72-Hz Super VGA monitor. But when we ran PC Labs' Windows benchmark test, the system performed exceptionally. For the disk subsystem, too, Tangent Computer chose a high-quality component, one that pumps the best performance out of the PC's Western Digital Piranha 4200 hard disk.

Few major manufacturers have stepped into Advanced Micro Devices' territory. Perhaps the major players are deterred by the Texas company's legal battle with Intel; possibly they are waiting until smaller, more daring companies with less to lose pave the way. But this is likely to change. AMD's chips in many cases have proven themselves better performers than

even Intel's 486/25s, and the chips' static design will give AMD the edge in the portable-PC market until Intel starts shipping its low-power 3-volt CPUs.

If you're looking for the least expensive machine you can buy, National Micro Systems' Flash 306-40C not only dips beneath the \$2,000 barrier by \$25, but its familiar components show fine all-round performance. Though you will pay an extra \$75 for a year of on-site service, you will have the security of GE Computer Services' familiar name.

Of the other systems PC Labs tested, those from Arche Technologies and PC Brand turned in solid scores. The Arche Legacy 386-40 comes with a painfully high price tag, though. And \$4,760 (after a 15 percent street discount) could buy you one of many 33-MHz 486 systems. PC Brand, meanwhile, falls short because of its overpriced service policies, such as an on-site service charge that amounts to 10 percent of the system's cost per year. At most, this policy is worth about \$100.

a mouse, as well as some extra programs, such as memory managers and the occasional disk-caching package.

More important than the freebies, however, are solid extended service-and-support packages from well-known sources such as GE Computer Services and TRW. You will find many systems backed by two-year warranties on parts and labor. Free on-site service or service at reduced rates for the first year is being offered by manufacturers, too.

Systems such as the Club Falcon 386/40 and the Northgate Slimline SP 386/40 offer a good number of user-upgradable processor options, and more than one of these units have cost-competitive 486SX versions of the same machines. With slimline, desktop, small-footprint, and tower models all shipped for this review, there

is little consistency on what case the hardware is packed in. Most can accept up to 64MB of 32-bit memory, either on the motherboard or with memory cards in proprietary slots. Most have five available expansion slots and three to four empty drive bays to accommodate a variety of drive configurations in the chassis.

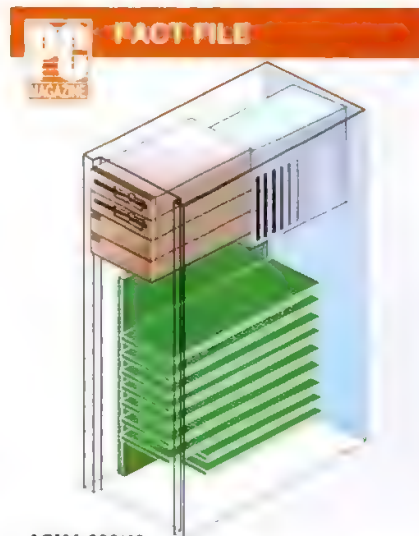
These features all add up to a group of machines that are best used as personal workstations optimized for common graphical-interface applications. The performance push from the 40-MHz Am386 makes them interesting, at least for the moment, and you could do a lot worse on pricing. If you are in a position to try out a less familiar product, you may just be pleased with the machines you'll encounter in the following pages.

ACMA COMPUTERS INC.
ACMA 386/40

by Kellyn Betts

In a market where prices fall frequently, the \$3,225 price tag on the Am386/40-based ACMA 386/40 places this machine among the more expensive PCs in this roundup. That outlay buys you *PC Magazine's* standard configuration of 8MB of RAM, a 210MB hard disk, a 1.44MB floppy disk drive, a Super VGA display subsystem, and DOS 4.01, as well as an extra 1.2MB floppy disk drive. The cost should be justified by the PC's FCC Class B certification and the high quality of its components, including a Quantum IDE hard disk, an Orchid ProDesigner IIs video board, a Sony Trinitron monitor, and 70-nanosecond Samsung RAM chips—if you could take full advantage of all of them, that is.

Just as a Ferrari capable of 190 mph. is wasted on a 65-mph. American highway, the Orchid ProDesigner IIs was precluded from roaring to its video speed capacity by what PC Magazine Labs diagnosed as



ACMA 386/40

ACMA Computers Inc., 48501 Warm Springs Blvd., #107, Fremont, CA 94539; 800-456-1818, 510-623-1212.

List price (tested configuration): \$3,225.

Memory and processor RAM cache: 8MB 70-ns. SIMMs, 64K cache.

Disk drives and controller: Quantum 15-ms. 210MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Orchid 1,024-by-768 adapter with 1MB RAM, Seiko 14-inch monitor.

Monitor refresh rate: 70 Hz.

Software: DOS 5.0, Microsoft Windows 3.0.



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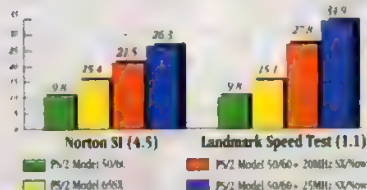
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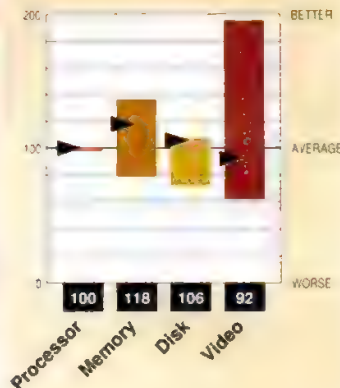
COMPUTERS 40-MHz AM386-BASED PCs

ACMA 386/40



In Short: The ACMA 386/40 has a lot of muscle. It falls slightly short only in video performance and only when compared with other systems in this roundup. PC Labs attributes the problem to a slow bus speed. Barring a few design quirks (such as inconveniently placed coprocessor and SIMM sockets), this FCC Class B-certified system is a decent choice.

TEST RESULTS



ACMA added an extra
66-MHz oscillator,
allowing the PC to
support 33-MHz as well
as 40-MHz coprocessors.

a slower bus speed, one that is slower than that of other Am386/40-based PCs. The result is a decidedly average video time from a board capable of producing superior ones. We attribute the problem to the ACMA computer's motherboard, manufactured by Helm Engineering but slightly modified to ACMA Computers' specifications. The Helm-manufactured motherboard inside the Amax PC/386-40 had similar problems.

The motherboard's speed warp did not deter the ACMA 386/40's 15-millisecond Quantum hard disk. Its fast memory benefited from 20-ns. cache memory and a direct-mapped, write-through cache controller with direct-mapped architecture. The PC turned in respectable times on the memory and disk benchmark tests, even with the tight competition.

ACMA is to be applauded for adding an extra 66-MHz oscillator, allowing the PC to support 33-MHz as well as 40-MHz

coprocessors. The machine's design has a few notable kinks, however. The empty coprocessor slot on the motherboard is positioned under the drive bays, making it next to impossible to mount a coprocessor without removing the motherboard. Similarly, the positioning of the SIMM chips makes it easy to install and remove them, but you must also use a board longer than half-length in either of the machine's two 8-bit slots. You need to place such boards in one of the six 16-bit slots; skirted 8-bit boards are not supported at all.

The ACMA 386/40 we tested came with a multiscanning Seiko monitor capable of a noninterlaced resolution of 1,024 by 768 pixels. This monitor is a \$320 upgrade over the Impression Plus monitor that comes standard with the ACMA 386/40. The two monitors share essentially the same specs, but the Seiko features a Sony Trinitron picture tube.

In its three years in business, ACMA has become known for generous service and support. TRW continues to provide any needed repairs at the discretion of ACMA's 800-number-based technical support staff, but the company has recently reduced its two-year free labor period to one. Nonetheless, this remains a better-than-average policy.

The ACMA 386/40 has some design kinks, and its bus speed slows down its Orchid video card. ACMA points out that the lower speed helps prevent compati-

bility problems, but a better arrangement might be to give users the higher speed and the ability to fall back to the lower speed if necessary.

AMAX ENGINEERING CORP. Amax PC/386-40

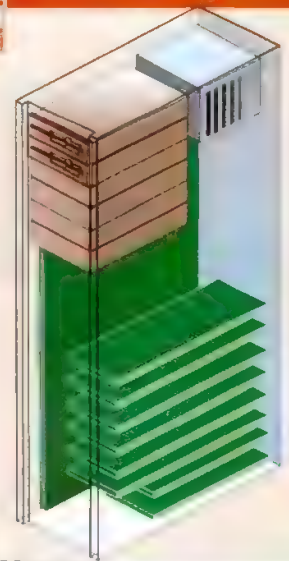
by Joseph Desposito

The Amax PC/386-40 is a system worth considering. It offers above-average memory and disk speed and quality components at a reasonable price. The system's only real fault is its slightly below-average video performance, a trait it shares with the closely-related ACMA 386/40. (At press time, the machine had an FCC Class A rating, but a company spokesperson said that a Class B specification is pending.)

The tower unit came equipped with 8MB of RAM, 64K of cache RAM, a 210MB Quantum IDE hard disk, 1.2MB and 1.44MB floppy disk drives, a multi-scanning monitor, and DOS 5.0. Also in-



FACT FILE



Amax PC/386-40

Amax Engineering Corp., 47315 Mission Falls Ct., Fremont, CA 94539; 510-651-8886.

List price (tested configuration): \$3,224.

Memory and processor RAM cache: 8MB 60-ns. SIMMs, 64K cache.

Disk drives and controller: Quantum 15-ms. 210MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Orchid 1,024-by-768 adapter with 1MB RAM, Seiko 14-inch monitor.

Monitor refresh rate: 72 Hz.

Software: DOS 5.0, Microsoft Windows 3.0.

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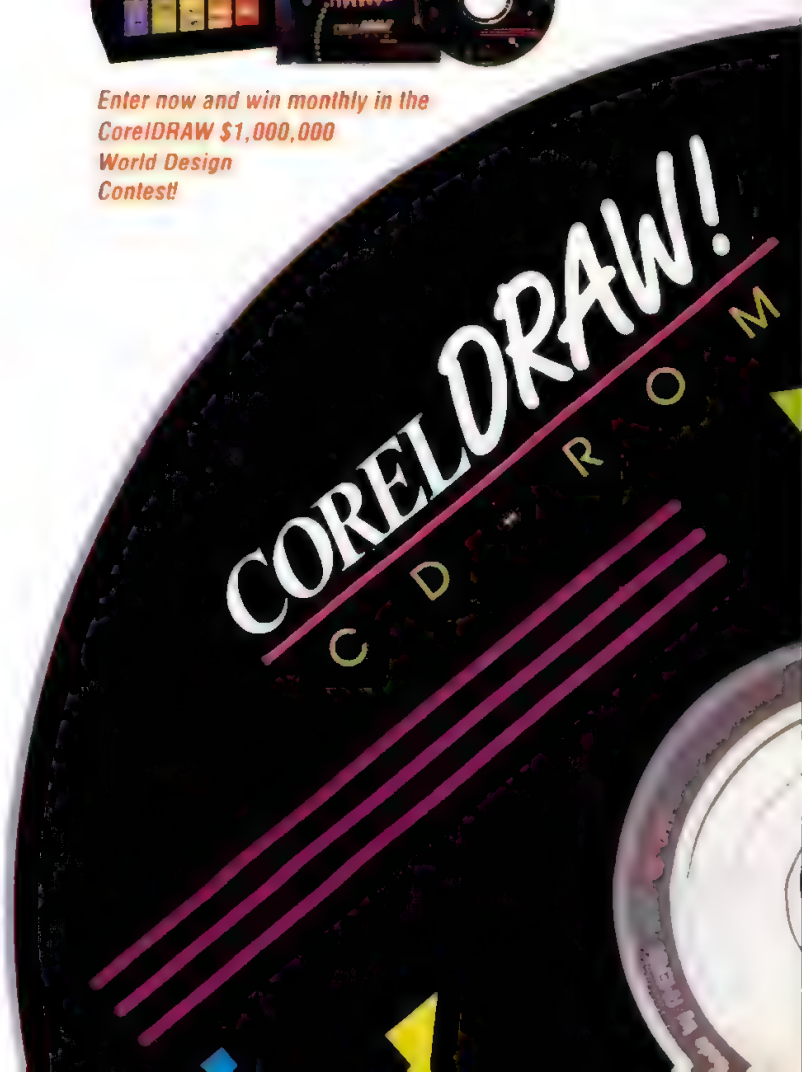


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40-MHz Am386-BASED PCs: SUMMARY OF FEATURES

List price (standard configuration) For this review of 40-MHz Am386 computers, we requested a standard configuration that included 8MB of RAM, a 200MB hard disk, two floppy disk drives, a Super VGA color display subsystem, one parallel and two serial ports, and DOS 5.0. All 15 PCs reviewed provide a reasonably close match to this list of requirements.

The price of the standard configuration is followed by the **standard hard disk capacity**. Unless otherwise noted, all table entries refer to the range of options available in the systems reviewed.

Distribution channel Some machines are sold directly through mail order, others through dealers. Dealers have previously offered discounts of 25 percent or more off the list price; however, an industry-wide price restructuring has cut these discounts in many cases. *PC Magazine* views a 15 percent discount as typical.

Bus architecture All 15 systems in this review use the 16-bit Industry Standard Architecture (ISA) bus. Extended Industry Standard Architecture (EISA) and Micro Channel architecture (MCA) allow 32-bit transfers.

Chip set manufacturer indicates which company makes the support logic that connects the CPU with the other functions managed by the system board.

Shadowing Shadow RAM is a technology that loads system BIOS or video BIOS directly into fast RAM on boot-up of the computer, offering enhanced performance speed. It uses a segment of system memory located between the boundary of conventional memory (640K) and the end of the first megabyte of installed RAM.

The **BIOS version** can affect PC Magazine Labs' benchmark test results. Those purchasing the same machine with a different BIOS version may encounter some variations in performance.

Flash EEPROM An EEPROM (electrically erasable programmable ROM) chip contains BIOS code that can be updated via software. The BIOS is generally stored in conventional ROM, which has no provision for modification.

Installable RAM indicates the minimum and maximum amount of memory that can be installed using any combination of chips and proprietary cards.

Drive bays Accessible drive bays can be reached from the system's front panel and can support removable media (such as tape and CD-ROMs); internal drive bays can be reached only by opening the case. We report the maximum number of accessible and internal drives the system can hold.

Minimal floppy disk drive configuration indicates whether the vendor equips its base-priced system with a 1.2MB floppy disk drive, a 1.44MB floppy disk drive, or both.

Hard disk options We report the range of hard disk capacities the vendor offers.

Disk controller type A computer with an IDE (integrated drive electronics) drive has disk controller functions integrated into the drive. Other drive types use separate controller cards.

Expansion bus For each type of expansion slot—8-bit, 16-bit, 32-bit EISA/MCA, and 32-bit proprietary—we report the number of slots on the motherboard and the number of slots left open when the PC is equipped in our standard configuration.

Display mode refers to the resolution of the video card that comes in the tested configuration. For this review, we requested a Super VGA display (800 by 600 pixels), though we accepted 1,024-by-768 resolution as well.

The **display circuitry** can reside on an expansion card or on the motherboard. Motherboard circuitry is often faster, but if it cannot be disabled there is no way to upgrade it.

Number of device connectors indicates how many internal storage devices the power supply can support without requiring Y cables (power splitters).

DOS versions and prices are listed here. If no price is given, the base-priced system includes DOS. (*PC Magazine's* standard configuration includes DOS 5.0—4.01 or 3.3 if 5.0 is not available—to allow more-accurate price comparisons.)

Other bundled software is software that comes with the system at no extra charge. This category includes disk-caching software (such as SMARTDRV.SYS), expanded memory management software (such as QEMM-386), Microsoft Windows 3.0, and any applications the vendor supplies as extras.

FCC Class B identification number Systems without a Class B rating from the Federal Communications Commission cannot be legally sold for home use. Public Access Link, the FCC's bulletin board service (301-725-1072), lists every Class B system by its FCC identification number.

CONTINUES

cluded was a \$225 Cyrix FasMath coprocessor (you can use an Intel or Weitek coprocessor instead). The system sells for a suggested retail price of \$2,999 without the coprocessor.

With 64K of 20-nanosecond static RAM and an Amax 85C310 cache controller, the PC/386-40 turned in a very good score on PC Magazine Labs' memory benchmark test. The Quantum ProDrive, with 56K of RAM on the built-in IDE controller card, helped the system perform very well on the disk test.

Though the PC's video test time was

somewhat below average, its video components provide a high-quality display. Both the 14-inch multiscanning monitor (a Seiko CM1450) and the video adapter (an Orchid ProDesigner IIs) are capable of displaying Super VGA noninterlaced images in the VESA-sanctioned 800-by-600 mode at 72 Hz.

The system motherboard, manufactured by Helm Engineering, uses the SIS chip set. The Award BIOS on the motherboard does one strange thing: It changes the default screen color to blue. If you don't like this, there is nothing you can do

about it, short of requesting a BIOS change.

You can install up to 32MB of RAM in 4MB SIMMs on the motherboard. If you want more RAM, the motherboard contains a proprietary 32-bit slot for a memory expansion board that holds an additional 32MB. The motherboard offers eight ISA expansion slots, two 8-bit and six 16-bit. No I/O ports are embedded on the motherboard. Parallel and serial ports come on one add-in board, and the floppy disk controller and IDE interface are located on another. The tower case offers space for you to add as many as six

COMPUTERS
40-MHz AM386-BASED PCs



40-MHz Am386-BASED PCs: SUMMARY OF FEATURES

Products listed in alphabetical order by company name

	ACMA 386/40	Amax PC/386-40	Arche Legacy 386-40	Ares 386/40 Sonic
List price (standard configuration)	\$3,225	\$2,999	\$5,602	\$3,200
Distribution channel	Direct	Dealers	Dealers	Dealers, direct
Case type	Desktop	Tower	Desktop	Tower
Bus architecture	ISA	ISA	ISA	ISA
Standard hard disk capacity	210MB	210MB	202MB	210MB
MOTHERBOARD				
Motherboard manufacturer	Helm Engineering	Helm Engineering	Arche	Technology Power
Chip set manufacturer	SIS	SIS	Arche	VLSI
System shadowing/Video shadowing	■ / ■	■ / ■	■ / ■	■ / ■
Upgradable processor	□	□	□	□
BIOS version	AMI 4.0	Award 401A0	AMI/Arche 1.51	AMI 386 Hybrid F
Flash EEPROM	■	□	□	□
Supports 80487/Weitek coprocessor	■ / ■	■ / ■	■ / □	□ / ■
MEMORY AND PROCESSOR RAM CACHE				
Installable RAM	1MB-64MB	1MB-64MB	1MB-16MB	1MB-64MB
Cache controller	Intel	Intel	Arche	Northport
Installable RAM cache	64K	64K	64K-128K	64K-256K
DISK DRIVES				
Accessible drive bays	Three 5.25-inch, no 3.5-inch	Six 5.25-inch, no 3.5-inch	Two 5.25-inch, no 3.5-inch	Four 5.25-inch, no 3.5-inch
Internal drive bays	2	None	3	2
Minimal floppy disk drive configuration	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB	1.2MB, 1.44MB
Hard disk options	105MB-650MB	52MB-1.2GB	40MB-650MB	52MB-665MB
Disk controller type	IDE	IDE	IDE	IDE
EXPANSION BUS				
8-bit slots	2 (1 open)	2 (1 open)	1 (open)	None
16-bit slots	5 (4 open)	6 (4 open)	6 (3 open)	7 (5 open)
32-bit EISA/MCA slots	None	None	None	None
32-bit proprietary slots	1 (open)	1 (open)	1 (open)	1 (open)
Parallel, serial, mouse ports on motherboard	None	None	None	None
VIDEO				
Display mode (tested configuration)	1,024 x 768	800 x 600	1,024 x 768	1,024 x 768
Display circuitry location	Card	Card	Card	Card
Chip set manufacturer	Tseng	Tseng	Tseng	Tseng
POWER SUPPLY				
Power supply (watts)	250	250	200	250
Number of device connectors	5	6	4	4
SOFTWARE				
DOS	5.0	5.0	4.01	5.0
Other bundled software	Microsoft Windows 3.0	Microsoft Windows 3.0	None	CheckIt, HyperWare Speed Kit 4.21, Microsoft Windows 3.0
MISCELLANEOUS				
Warranty	1 year	1 year	2 years	2 years parts, unlimited labor
First year on-site service charge	No charge	\$149	\$149 for 21 months	No charge
FCC Class B identification number	IR7ACMA386L	None	GVW386-40S2	18138640

PC —Editors' Choice

■—Yes

□—No

N/A—Not applicable: The product does not have this feature.

AMI—American Megatrends Inc., ATI—ATI Technologies Inc., C&T—Chips and Technologies Inc.,

ETEQ—ETEQ Microsystems Inc., SIS—Silicon Integrated Systems Corp., TMC—TMC Research Corp., VLSI—Very Large Scale Integrated Technology Inc.

COMPUTERS

10-MHz AM386-BASED PCs

Club Falcon 386/40	CyberMax 386/40	Eltech Model 3400	Hyundai Corporate Series 386/40
\$2,695	\$2,350	\$2,439	\$4,545
Direct Desktop ISA 213MB	Dealers Small-footprint ISA 210MB	Dealers, direct Small-footprint ISA 210MB	Dealers Small-footprint ISA 200MB
Club	Fountain	Eltech	Motherboard Factory VLSI/Northport
VLSI ■ / □	Intel/VLSI ■ / ■	OPTi ■ / ■	■ / ■
AMI 386 Hybrid F	Quadtel 3.05.07	Mr. BIOS 1.0E	AMI 5.05
□	□	□	□
■ / ■	■ / ■	■ / ■	■ / ■
4MB-64MB Club 64K-256K	1MB-31MB Intel 16K	1MB-64MB OPTi 64K-128K	1MB-64MB Proprietary 64K-256K
Three 5.25-inch, no 3.5-inch 2 1.2MB 52MB-340MB IDE	Three 5.25-inch, one 3.5-inch 1 1.2MB, 1.44MB 210MB-380MB IDE	Three 5.25-inch, two 3.5-inch None 1.2MB 40MB-1GB IDE	Three 5.25-inch, no 3.5-inch 2 1.2MB 100MB-300MB IDE
None 7 (5 open) None 1 (none open) 1, 2, 0	None 8 (6 open) None 1 (none open) None	None 7 (6 open) None 1 (open) 1, 2, 0	None 7 (6 open) None 1 (none open) 1, 2, 0
1,024 x 768 Card Tseng	1,024 x 768 Card Tseng	1,024 x 768 Card Trident	1,024 x 768 Card ATI
200 4	200 5	200 5	200 6
5.0 Microsoft Windows 3.0, QEMM-386	5.0 Microsoft Windows 3.0	5.0 Microsoft Windows 3.0	5.0 Microsoft Windows 3.0
1 year	1 year	1 year	18 months
\$25 IP5-FALCON7	N/A E5QFTNB386WH-40C	\$69 IOERICOMP-340A	\$189 IMX38640MBP

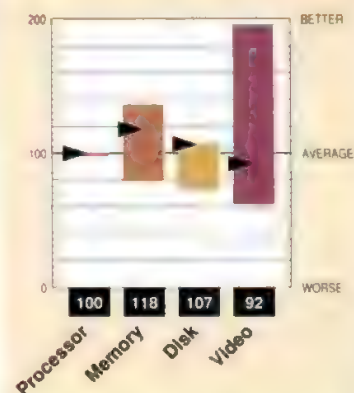
CONTINUES

Amax PC 386-40



In Short: The Amax PC/386-40 posted good memory scores, with help from a 64K 20-ns. RAM cache and an Amax 85C310 cache controller. The Quantum ProDrive helped it produce an above-average time on the disk test, too. Due to a slower bus speed, however, this machine faltered on the video test; the ACMA 386/40 had the same problem.

TEST RESULTS



1.2MB floppy disk drives.

Amax Engineering Corp. offers a one-year warranty on parts and labor, with on-site service from Memorex costing an additional \$149. Technical support is available but not through a toll-free number.

Amax provides a complete line of systems. The ones that compete most closely with this model are a 386/33, which sells for \$100 less, and a 486/25, which sells for about \$300 more. Both are ISA systems, but Amax also sells a 486/25 EISA system.

The only knock against the Amax PC/386-40 is a bus speed that caused a below-average result on the video benchmark test. Otherwise, the system offers solid performance and quality components at an affordable price.

COMPUTERS

40-MHz AM386-BASED PCs

40-MHz Am386-BASED PCs: SUMMARY OF FEATURES

Products listed in alphabetical order by company name

	Intelec INT 386-40	Micro Express ME 386-40	National Micro Systems Flash 386-40C	Northgate Slimline SP 386/40
List price (standard configuration)	\$2,350	\$2,959	\$1,925	\$3,999
Distribution channel	Dealers, direct	Direct	Direct	Dealers, direct
Case type	Desktop	Small-footprint	Small-footprint	Small-footprint
Bus architecture	ISA	ISA	ISA	ISA
Standard hard disk capacity	210MB	202MB	200MB	200MB
MOTHERBOARD				
Motherboard manufacturer	Premio	AMI	LAN Distributing	Motherboard Factory
Chip set manufacturer	ETEQ	C&T/Discrete logic	Intel	VLSI/proprietary
System shadowing/Video shadowing	■ / ■	■ / ■	■ / ■	■ / ■
Upgradable processor	□	□	□	■
BIOS version	AMI (February 1991)	AMI (August 1990)	Quadtel 3.05.07	AMI B7VJN 1990
Flash EEPROM	□	□	□	□
Supports 80487/Weitek coprocessor	■ / ■	■ / □	■ / ■	■ / ■
MEMORY AND PROCESSOR RAM CACHE				
Installable RAM	1MB-64MB	1MB-64MB	1MB-32MB	1MB-32MB
Cache controller	Discrete logic	Discrete logic	Intel	Northport
Installable RAM cache	64K	64K-128K	16K	64K-256K
DISK DRIVES				
Accessible drive bays	Three 5.25-inch, one 3.5-inch	Two 5.25-inch, one 3.5-inch	Three 5.25-inch, one 3.5-inch	One 5.25-inch, one 3.5-inch
Internal drive bays	2	2	1	1
Minimal floppy disk drive configuration	1.2MB, 1.44MB	1.2MB	1.44MB	1.2MB
Hard disk options	105MB-330MB	80MB-1.2GB	40MB-1.2GB	52MB-535MB
Disk controller type	IDE	IDE	IDE	IDE
EXPANSION BUS				
8-bit slots	1 (open)	2 (2 open)	None	2 (2 open)
16-bit slots	6 (5 open)	6 (4 open)	8 (6 open)	3 (3 open)
32-bit EISA/MCA slots	None	None	None	None
32-bit proprietary slots	1 (open)	None	1 (open)	None
Parallel, serial, mouse ports on motherboard	1, 2, 0	None	None	1, 2, 0
VIDEO				
Display mode (tested configuration)	800 x 600	800 x 600	1,024 x 768	800 x 600
Display circuitry location	Card	Card	Card	Motherboard
Chip set manufacturer	Trident	Tseng	Tseng	ATI
POWER SUPPLY				
Power supply (watts)	200	200	200	150
Number of device connectors	4	5	5	3
SOFTWARE				
DOS	5.0	4.01	5.0	5.0
Other bundled software	Microsoft Windows 3.0	None	None	HyperText DOS, Microsoft Windows 3.0, Q&A Plus 4.52
MISCELLANEOUS				
Warranty	1 year	2 years	15 months parts, 2 years labor	1 year
First year on-site service charge	N/A	\$50	\$75	No charge
FCC Class B identification number	JE0INT386-40	GXUME38640	E5QFTNB386WH-40C	GT638640EM

■ —Editors' Choice

■ —Yes

□ —No

N/A—Not applicable: The product does not have this feature.

AMI—American Megatrends Inc., ATI—ATI Technologies Inc., C&T—Chips and Technologies Inc.,

ETEQ—ETEQ Microsystems Inc., SIS—Silicon Integrated Systems Corp., TMC—TMC Research Corp., VLSI—Very Large Scale Integrated Technology Inc.

COMPUTERS

40-MHz AM386-BASED PCs

ARCHE TECHNOLOGIES INC.
Arche Legacy 386-40

by John R. Quain

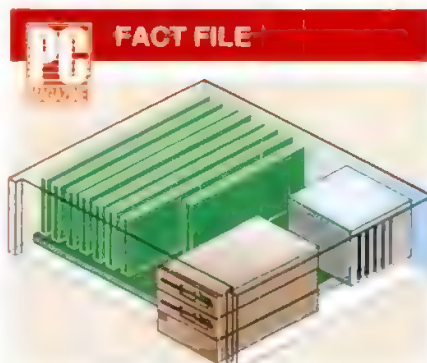
At \$5,602, the Arche Legacy 386-40 is the most expensive of the 40-MHz 386 PCs in our review. Even so, the Legacy does not offer the best performance or roomiest case. What it does offer, Arche Technologies will argue, is quality construction.

Housed in a classic AT desktop case, the Legacy is a no-nonsense ISA system with an AMI/Arche BIOS on Arche's own motherboard and chip set. As part of its extensive circuit and compatibility testing, Arche performs a 48-hour burn-in on the motherboard, in addition to a 48-hour burn-in on the system. Underlining the machine's quality workmanship, the company covers the Legacy with a full-system two-year parts-and-labor warranty.

In *PC Magazine's* standard configuration, the Legacy arrived with DOS 4.01 installed and 8MB of 70-nanosecond dynamic RAM. The motherboard's eight SIMM sockets will manage a total of 16MB of DRAM but ships with 1MB modules installed. You will have to remove your original memory investment to upgrade to full memory capacity. The system board includes a 64K 20-ns. static RAM cache as standard. Arche boosted that in the system we tested with an addi-

PC Brand 386/40 Cache System	SST 386-40MWC	Tangent Model 340
\$3,075	\$2,925	\$3,295
Direct Desktop ISA 211MB	Dealers, direct Small-footprint ISA 200MB	Dealers, direct Desktop ISA 202MB
PC Brand	TMC	Technology Power
OPTi ■ / ■ ■ AMI (February 1991) □ ■ / ■	OPTi ■ / ■ □ AMI 3.31 □ ■ / ■	VLSI ■ / ■ □ AMI 1.7 □ ■ / ■
1MB-64MB OPTi 128K-256K	1MB-64MB OPTi 64K-256K	1MB-64MB Northport 64K-256K
Three 5.25-inch, one 3.5-inch 2 1.2MB	Three 5.25-inch, two 3.5-inch None 1.2MB	Three 5.25-inch, no 3.5-inch 1 1.2MB
40MB-1.2GB IDE	44MB-2.1GB IDE	52MB-2GB IDE
None 6 (5 open) None 1 (open) 1, 2, 0	2 (2 open) 6 (4 open) None None None	None 7 (5 open) None 1 (none open) None
800 x 600 Card Tseng	1,024 x 768 Card Tseng	1,024 x 768 Card S3
200 4	200 5	200 4
5.0 (\$70) None	5.0 Cache86, PreCursor, TREE86	5.0 PC-Kwik Power Pak
1 year	1 year	1 year
10% of system cost	No charge	No charge
IH8CAWB38640D01	FHH3XG-340X	IP5-340SC

ENDS

**Arche Legacy 386-40**

Arche Technologies Inc., 48502 Kato Rd.,
Fremont, CA 94538; 800-437-1688,
510-623-8100.

List price (tested configuration): \$5,602.

Memory and processor RAM cache: 8MB
70-ns. SIMMs, 128K cache.

Disk drives and controller: Western Digital
16-ms. 202MB IDE hard disk, 1.2MB and
1.44MB floppy disk drives.

Display: Diamond 1,024-by-768 adapter with
1MB RAM, Arche 14-inch monitor.

Monitor refresh rate: 70 Hz.

Software: DOS 4.01.

CIRCLE 404 ON READER SERVICE CARD

Compudyne Notebooks

386SL/20 Notebook^{††} VGA Mono, 60 MB \$2199

- ▼ Intel® 80386SL 20 MHz processor.
- ▼ 64 K CPU Cache
- ▼ 2 MB RAM
- ▼ 60 MB, 19 ms hard drive
- ▼ Optional 80387SX coprocessor
- ▼ 1.44 MB, 3 1/2" internal floppy drive
- ▼ 10" 64-grey scale LCD VGA display
- ▼ 1 parallel, 2 serial ports
- ▼ External monitor and keyboard ports
- ▼ 6.4 lbs., 8.5" x 11" x 1.9"
- ▼ MS-DOS 5.0 and file transfer utilities



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It combines the power of a 20 MHz 80386SL processor, with a 64 K CPU cache, which gives you up to 30% more processing speed than conventional 386SX 20 MHz notebooks while reducing power consumption up to 70%!

300% more battery life!

Most SX notebooks offer a maximum 3-hour battery life with a useful working time of only 1 to 2 hours. Now, with the new Intel 386SL chips, battery life is extended to over 9 hours, with a continuous working time of over 3 hours! Plenty of time to get some real work done.

Incredibly smart power management!

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Never lose your work!

Our SL notebook has the ability to detect when the battery is low and "saves everything" in RAM memory until you get a chance to plug in and recharge! Your work is restored exactly where you left off.

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We dare you to compare it to any current model on the market. Its brilliance, the depth of its color mapping and full 10" size make working with our SL Notebook a pleasure.

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- ▼ Custom configurations
- ▼ Corporate credit terms
- ▼ Volume purchase agreements

**386SX/16 Notebook^{††}
VGA Mono, 40 MB
\$1499**

- ▼ Intel 80386SX 16 MHz processor
- ▼ 2 MB RAM (Max to 16 MB)
- ▼ 40 MB, 19 ms hard drive
- ▼ Optional 80387SX coprocessor
- ▼ 1.44 MB, 3 1/2" internal floppy drive
- ▼ 9" 32-grey scale LCD VGA display
- ▼ 1 parallel, 2 serial ports
- ▼ External monitor and keyboard ports
- ▼ 6.5 lbs., 8.5" x 11" x 2.5"
- ▼ 3-hour battery pack
- ▼ MS-DOS 5.0 and file transfer utilities

**386SX/20 VGA^{††}
Mono, 60 MB
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 - ▼ 2 MB RAM (Max to 16 MB)
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	Compudyne NB5X/16	ZEOS 386SX/16 Notebook	CompuAdd 316NX	Compudyne NB5X/20
CPU	Intel386SX, 16 MHz	Intel386SX, 16 MHz	Intel386SX, 16 MHz	Intel386SX, 20 MHz
Std. Memory	2 MB	1 MB	2 MB	2 MB
Max. Memory	16 MB	3 MB	6 MB	16 MB
CPU Cache	none	none	none	none
Hard Drive	40 MB IDE	20 MB IDE	30 MB IDE	60 MB IDE
I/O Ports	2 serial, 1 parallel/ monitor/keyboard	1 serial, 1 parallel/ monitor	1 serial, 1 parallel/ monitor/keyboard	2 serial, 1 parallel/ monitor/keyboard
Screen	9" 32 grey	10" 32 grey	10" 32 grey	9" 32 grey
Software	MS-DOS 5.0	none	MS-DOS 4.01	MS-DOS 5.0
Weight	6.5 lbs	7 lbs	6 lbs	6.5 lbs
Price	\$1499	\$1995	\$1995	\$1699

	ZEOS 386SX/20	Northgate 386SX/20	Compudyne NB5L/20	Zenith Mastersport 386SL
CPU	Intel386SX, 20 MHz	Intel386SX, 20 MHz	Intel386SL, 20 MHz	Intel386SL, 20 MHz
Std. Memory	1 MB	1 MB	2 MB	2 MB
Max. Memory	5 MB	5 MB	6 MB	8 MB
CPU Cache	none	none	64 K	64 K
Hard Drive	20 MB IDE	40 MB IDE	60 MB IDE	60 MB IDE
I/O Ports	1 serial, 1 parallel/ monitor	2 serial, 1 parallel/ monitor/keyboard	2 serial, 1 parallel/ monitor/keyboard	1 serial, 1 parallel/ monitor/keyboard
Screen	10" 32 grey	8.5" 32 grey	10" 64 grey	9" 32 grey
Software	none	MS-DOS 5.0	MS-DOS 5.0	MS-DOS 4.01
Weight	7 lbs	6.1 lbs	6.4 lbs	6.8 lbs
Price	\$2295	\$2199	\$2199	\$2499

Compudyne notebooks are also sold retail exclusively through CompUSA, the Computer SuperstoreSM.



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*If you find a current lower advertised price in this publication, we will beat that price, guaranteed! Competitor must have stock at the published price. Shipping and surcharges will be calculated. Special manufacturers' rebates may not apply. Competitor's system must meet or exceed all Compudyne specifications to qualify. All returns must be in "as new" condition, with original packaging, complete. Prices and specifications subject to change without notice. ††Intel386™ and the Intel Inside logo are trademarks of Intel Corporation 1902 12-91



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Best price... Guaranteed!*

Or the selection and quality you demand!

386SX/16^{††}
VGA Color, 40 MB HD
\$899

- ▼ Intel[®] 80386SX CPU
- ▼ 1 MB RAM
- ▼ 40 MB IDE hard drive
- ▼ 1.2 or 1.44 MB FD
- ▼ 16-bit Super VGA card
- ▼ 14" 640 x 480 VGA color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

Business Lease from \$38/mo.¹

386SX/20^{††}
VGA Color, 40 MB HD
\$999

- ▼ Intel 80386SX CPU
- ▼ 1 MB RAM
- ▼ 40 MB IDE hard drive
- ▼ 1.2 or 1.44 MB FD
- ▼ 16-bit Super VGA card
- ▼ 14" 640 x 480 VGA color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

Business Lease from \$43/mo.¹

386SX/20^{††}
Super VGA, 80 MB HD
\$1399

- ▼ Intel 80386SX CPU
- ▼ 2 MB RAM
- ▼ 80 MB IDE hard drive
- ▼ 1.2 and 1.44 MB FDs
- ▼ 16-bit Super VGA card
- ▼ 14" 1024 x 768 Super VGA color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

Business Lease from \$53/mo.¹

386DX/25^{††}
Super VGA, 80 MB HD
\$1599

- ▼ Intel 80386 CPU
- ▼ 2 MB RAM***
- ▼ 80 MB IDE hard drive
- ▼ 1.2 and 1.44 MB FDs
- ▼ 16-bit Super VGA card
- ▼ 14" 1024 x 768 Super VGA color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

***Add \$75 for 32 K CPU cache
Business Lease from \$60/mo.¹

386DX/33 Cache^{††}
Super VGA, 120 MB
\$1899

- ▼ Intel 80386 CPU
- ▼ 4 MB RAM, 32 K cache
- ▼ 120 MB IDE hard drive
- ▼ 1.2 and 1.44 MB FDs
- ▼ 16-bit SVGA w/1 MB
- ▼ 1280 res. & 32 K colors
- ▼ 14" 1024 x 768 Super VGA non-interlaced color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

Business Lease from \$71/mo.¹

486SX/20^{††}
Super VGA, 120 MB
\$1999

- ▼ Intel 80486SX CPU
- ▼ 4 MB RAM
- ▼ 120 MB IDE hard drive
- ▼ 1.2 and 1.44 MB FDs
- ▼ 16-bit SVGA w/1 MB
- ▼ 1280 res. & 32 K colors
- ▼ 14" 1024 x 768 Super VGA non-interlaced color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

Business Lease from \$75/mo.¹

486DX/33 Cache^{††}
Super VGA, 120 MB
\$2499

- ▼ Intel 80486 CPU
- ▼ 4 MB RAM, 128 K cache
- ▼ 120 MB IDE hard drive
- ▼ 1.2 and 1.44 MB FDs
- ▼ 16-bit SVGA w/1 MB
- ▼ 1280 res. & 32 K colors
- ▼ 14" 1024 x 768 Super VGA non-interlaced color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

Business Lease from \$93/mo.¹

Video Options:
14" Mono VGA
14" Color VGA
14" 1024 Interlaced Color VGA
14" 1024 Non/interlaced Color VGA
17" 1280 Non/interlaced Color VGA

Hard Drive Options:
40 MB 211 MB
80 MB 483 MB
105 MB 680 MB
120 MB 1.2 GB

Internal CD-ROM
\$349 Includes
Grippers,
Toolworks and PC-SIG.

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\$99 9600 bps s/r fax,
2400 bps modem,
w/ WinFax & QuickLink.

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BENCHMARK TESTS: 40-MHz AM386-BASED PCs

WHAT THE NUMBERS MEAN

Megahertz matter. Faster than 386/33s and 486SX/20s, these 15 Am386/40-based PCs turned in noteworthy processor, memory, and disk scores. **Video subsystems, too, showed significant speed improvements over PCs based on the Intel 80386 and 80486SX chips.**

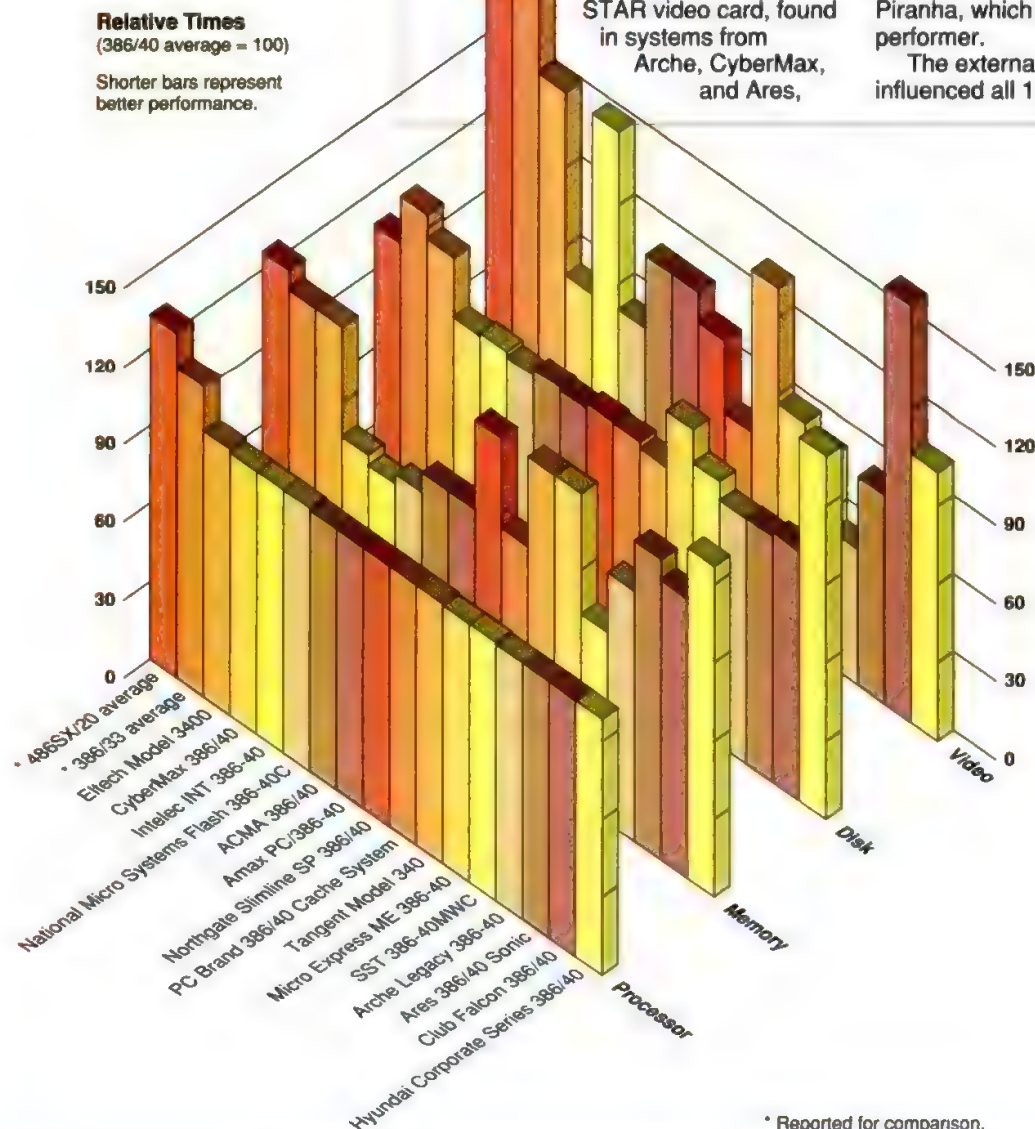
All 15 AMD Am386-based systems in this review outpaced the average scores of the Intel 386/33 and 486SX/20 systems tested by PC Magazine Labs over the past two years. In most cases, the processor test times were predictably 15 to 20 percent shorter than those of 386/33s, due to the clock-rate increase.

Video scores showed the most significant gains over 386/33s and 486SX/20s; on the average, these systems beat the average 386/33 video test time by more than 50 percent. The Tseng-based Diamond Speed STAR video card, found in systems from Arche, CyberMax, and Ares,

turned in fine scores. Contrary to expectation, the Club system's Tseng-based Rainbow card, with 256K of RAM, performed poorly. When we increased the card's memory to 512K and then 1MB, performance improved. The Trident VGA card used in PCs from Eltech and Intelec turned in characteristically slow performance.

Disk scores were tightly bunched. The Hyundai system's Conner CP3104F hard disk showed sluggishness in the sequential write portion of PC Labs' DOS File Access test. Two other subpar hard disk performers: the Eltech's Seagate ST1239A and the Micro Express's Western Digital Piranha, which is normally a top performer.

The external processor RAM cache influenced all 15 memory scores. Sys-



* Reported for comparison.

40-MHz AM386-BASED PCs

tems with exactly 64K of direct-mapped write-back processor RAM cache typically performed more slowly than those with any combination of larger size, four-way set associativity, or write-through write policy. A Northport cache controller was also found in five systems with relatively slow memory: Hyundai, Northgate, Tangent, Ares, and Club.

The best memory scores came from the Intelec INT 386-40, which contained a 64K direct-mapped write-through cache and discrete-logic controller, and the Sirius SST 386-40MWC, with a larger 256K cache and an OPTi 386WB caching memory controller. The CyberMax and National Micro Systems configurations showed good memory performance, using Intel 82395-25 Smart Cache controllers.

HOW WE TESTED

In testing these 15 386/40 PCs, we used PC Magazine Labs' Hardware Performance Tests, Release 5.7, with the RAM cache and all shadowing enabled wherever possible. Disk performance is reported without software disk caches, and no RAM-resident programs were loaded for any tests. The margin of error for the processor, memory, and video benchmark tests is 0.05 seconds, so take this into account when making purchasing decisions based primarily on speed.

■ The **80386 Instruction Mix** benchmark test times a series of tasks specific to the 80386 chip. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, faster times mean better overall computer performance.

■ The **Conventional Memory** benchmark test measures the read/write speed of the first 640K of memory. Slower times can indicate the presence of memory wait states or memory chips rated at relatively slow access speeds.

■ The disk score is the sum of the small-record and large-record **DOS File Access** benchmark test times. Each test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. No software cache is employed.

■ The **Direct to Screen** benchmark test indicates the speed of the video adapter memory. A good score indicates that information can get to the screen quickly, particularly for programs that avoid the computer's BIOS and go directly to the screen.

Lower scores represent better performance.

	Processor (seconds)	Memory (seconds)	Disk (seconds)	Video (seconds)
* 486SX/20 average	1.86	0.33	46.16	1.66
* 386/33 average	1.67	0.31	53.84	2.01
Elitech Model 3400	1.43	0.31	49.88	1.43
CyberMax 386/40	1.41	0.20	40.04	0.76
Intelec INT 386-40	1.41	0.19	40.54	1.42
National Micro Systems Flash 386-40C	1.41	0.20	39.77	0.77
ACMA 386/40	1.40	0.22	40.73	1.04
Amaz PC/386-40	1.40	0.22	40.26	1.04
Northgate Slimline SP 386/40	1.40	0.31	41.21	0.93
PC Brand 386/40 Cache System	1.40	0.22	40.84	0.66
Tangent Model 340	1.40	0.31	39.73	1.26
Micro Express ME 386-40	1.39	0.31	49.06	0.83
SST 386-40MWC	1.39	0.19	43.50	0.77
Arche Legacy 386-40	1.38	0.25	40.36	0.50
Ares 386/40 Sonic	1.38	0.30	40.56	0.77
Club Falcon 386/40	1.38	0.28	41.28	1.54
Hyundai Corporate Series 386/40	1.38	0.33	60.00	0.99

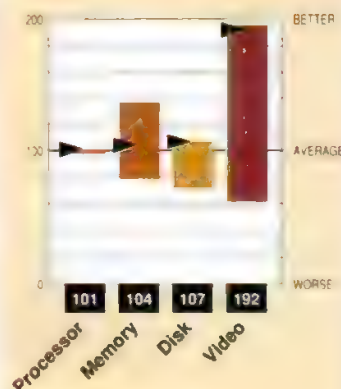
tional 64K 15-ns. SRAM SIMM (normally a \$216 option). None of the I/O sections are integrated into the system board. The Legacy's IDE pass-through card carries I/O functions and takes up two slots (there are no connector punch-outs in the back of the case). With the video card installed, there are five unoccupied slots, including one 8-bit and one proprietary expansion connector. The proprietary slot is designed to accommodate an as yet unreleased 16MB Arche memory expansion card.

The old-fashioned AT case limits the machine's storage space. There are only two externally accessible standard-height drive bays, one containing a 1.2MB and one holding a 1.44MB TEAC floppy disk



In Short: Backed by a two-year warranty and free 90-day on-site service, the Arche system offers the advantage of quality components. The company also asks for a considerable investment: \$5,602 (minus whatever street discounts you can find). The Arche Legacy 386-40's notable VGA performance will please general business users, but the Arche monitor won't meet all the demands of CAD. And unfortunately, a reputation for solid workmanship will not be enough to convince many to foot the bill.

▶ TEST RESULTS



To keep up with the faster CPU, Arche's 128K ProCache controller uses a four-level write-posting and paging scheme.

drive. Inside, a sub-16-millisecond 200MB Western Digital Piranha 4200 hard disk fills the remaining half-height bay. If you want to add two additional internal 3.5-inch hard disks, the package includes brackets you can screw into the sides of the case. If you need more room, Arche sells a large tower-case option with a 400-watt power supply for \$300.

Belying its traditional exterior is the internal 40-MHz Am386DX CPU, which performed on a par with the other systems tested. To keep up with the faster CPU, Arche's 128K ProCache controller uses a sophisticated four-level write-posting and paging scheme that is intended to operate as an intelligent write-back arrangement. On PC Magazine Labs' tests, however, the Legacy's system memory scored in the middle of the pack.

The popular Piranha disk's time was about average. On video performance, however, the Legacy turned in by far the fastest VGA time by using the Diamond SpeedSTAR Plus adapter, a popular card among users and manufacturers looking for straight VGA throughput. The adapter, which provided a 1,024-by-768 resolution, came loaded with 1MB of 70-ns. memory. However, the Arche PX-14S 14-inch multiple-frequency monitor can achieve an interlaced resolution only at 1,024 by 768 and is not capable of noninterlaced imaging.

The Legacy is sold through dealers and value-added resellers. Buyers can expect discounts of about 20 percent off the list price. But even the reduced price is \$500 more than for comparably equipped 386/40 systems and more expensive than some 25-MHz 486DX machines. Arche blankets its machines with toll-free technical support, free 90-day on-site service, and a two-year warranty. If price and performance is the only phrase the managers in your office understand, though, you will have trouble making a case for the Arche Legacy 386-40.

ARES MICRODEVELOPMENT INC.

Ares 386/40 Sonic

by Greg Pastrick

In terms of dollars for power, the Ares 386/40 Sonic buys better-than-average computing. It produced good scores on our processor, disk, and video tests, thanks to sound components such as a 15-millisecond Quantum IDE hard disk and 16-bit SpeedSTAR Super VGA card from Diamond Computer Systems. At \$3,200 for our standard configuration, the system outperforms and costs nearly \$200 less than Ares Microdevelopment's step up to the 486SX/20 (reviewed in *PC Magazine*, December 31, 1991).

Nevertheless, the Sonic's 70-nano-second system memory, with the 15-ns. memory caching enabled, was 0.11 seconds behind the best scores this group produced on PC Magazine Labs' bench-

mark tests. The small 64K external cache (expandable to 256K) is partly responsible for this. But the slowdown is more a reflection of the direct-mapped caching implementation used in the Northport controller found in several systems reviewed here.

In contrast, the SpeedSTAR video card, with its 1,024-by-768 maximum resolution and 256 simultaneously displayable colors, produced a better-than-average video test result with 1MB of video RAM installed. The ViewSonic 5E display that came with our system not only supports a broad range of display modes, it presents an atypical array of screen controls, including horizontal and vertical centering and sizing wheels. A multiple-frequency monitor, it can handle a maximum resolution of 1,024 by 768 noninterlaced and a refresh rate of 72 Hz.

The screen controls reflect Ares' habit of providing extras as standard equipment. Our system also included an enhanced Focus Electronics keyboard with built-in calculator and LCD panel, DOS 5.0, Microsoft Windows 3.0 and mouse, TouchStone Software's *CheckIt* diagnostic software, and *HyperWare* Speed Kit package of cache, keyboard, and screen utilities.

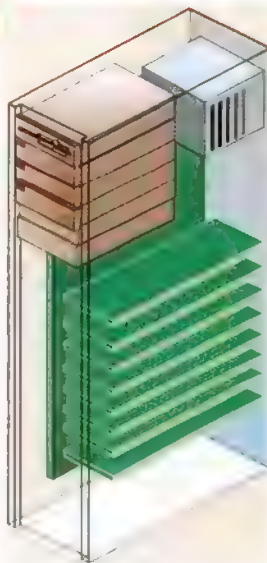
The Technology Power mini-AT ISA motherboard comes standard with 8MB of dynamic RAM in SIMM packaging. You can expand this to 32MB on the motherboard, but you need to swap out the original 1MB SIMMs. The system's mini-tower design lends easy access to most sockets and slots, but the SIMM slots are a bit harder to get at because of an internal full-length chassis brace. Metal clips lock the SIMM cards into position instead of the familiar all-too-breakable plastic ones.

As tested, the Sonic had six open slots. Of the eight expansion slots on the system board, the last slot is reserved for a proprietary 32-bit memory card that can boost system RAM to 64MB. Parallel and serial ports originate from a fairly common DTK multifunction floppy/hard disk controller card. The motherboard also provides an open socket for a Weitek coprocessor, but Ares recommends (and sells) a \$198 Cyrix FasMath coprocessor. An AMI 386 chip controls BIOS operations, while setup options for the system, contained in CMOS, include password-protected access.

The company offers slimline, AT desktop, mini-tower, and full-tower chassis options. The mini-tower we tested offers



FACT FILE

**Ares 386/40 Sonic**

Ares Microdevelopment Inc., 23660-A Research Dr., Farmington Hills, MI 48335; 800-322-3200, 313-473-0808.

List price (tested configuration): \$3,200.

Memory and processor RAM cache: 8MB 70-ns. SIMMs, 64K cache.

Disk drives and controller: Quantum 15-ms. 210MB IDE hard disk, DTK controller, 1.2MB and 1.44MB floppy disk drives.

Display: Diamond 1,024-by-768 adapter with 1MB RAM, ViewSonic 14-inch monitor.

Monitor refresh rate: 72 Hz.

Software: DOS 5.0, Microsoft Windows 3.0, *CheckIt*, *HyperWare* Speed Kit 4.21.

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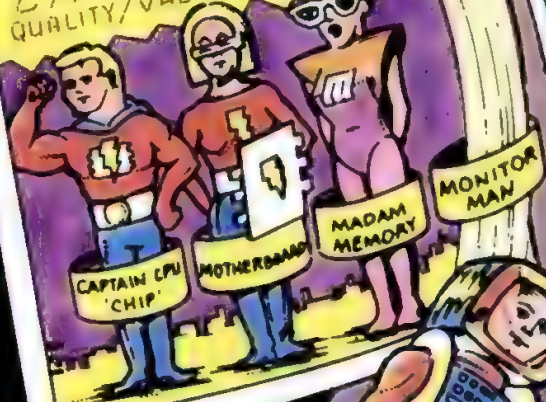
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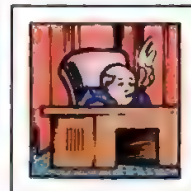
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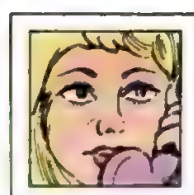
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- 101 Keyboard
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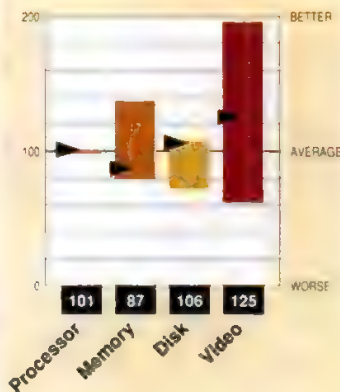
40-MHz AM386-BASED PCs

Ares 386/40 Sonic



In Short: The Ares 386/40 Sonic is a solid system, one marked by generous hardware, software, service, and support. It did better than average on our processor, disk, and video tests, though a small standard cache hurt the system's memory performance. Diagnostic software, a utility package, Microsoft Windows 3.0, and a free bundled mouse all sweeten the deal.

TEST RESULTS



enough room for external access to up to four drives. The drives are stacked above the unit's control panel, where power, reset, and turbo buttons are available. Internal bays can accommodate two additional drives.

Ares' service and warranty policies are enticing, with unlimited labor and a two-year parts guarantee. On-site service from TRW is free for the first year and for \$49 can be extended into the second year. Included in the package are 24-hour toll-free technical support and a 60-day "no questions asked" return policy.

The Ares 386/40 Sonic is an appealing package with enough extras in hardware, software, service, and support to justify its price.

CLUB AMERICAN TECHNOLOGIES INC.

Club Falcon 386/40

by Greg Pastrick

The Club Falcon 386/40 is but one stop on an upgrade path marked with six processor cards. Club American Technologies' Falcon series starts with the Intel 25-MHz 386, ends with the Intel 33-MHz 486, and takes a 486SX/20 detour along the way. The Falcon 386/40 offers good disk and processor performance, a large memory capacity, reliability, and easy upgradabil-

ity at a good price, although its video and memory could be faster.

For our review, Club American Technologies shipped its basic Falcon 386/40 system in a classic AT chassis configured with 8MB of 70-nanosecond RAM, a 210MB Maxtor hard disk, one TEAC 1.2MB floppy disk drive, a Club 500A Super VGA display, a Tseng chip-based VGA 4000 Super VGA video card, DOS 5.0, Microsoft Windows 3.0, and a mouse,

all for a relatively reasonable \$2,955.

Aside from the change in microprocessors and circuitry, there is little difference among the processor cards. Every 5-by-7-inch proprietary 32-bit processor card contains a minimum of 64K of cache RAM, upgradable to 256K for \$250. The cards all include an open Intel/Weitek-compatible coprocessor socket that also supports Cyrix and ULSI math chips, sold as \$199 options. And all processor cards plug into a standard ISA mini-AT motherboard. An AMI BIOS, VLSI chip set, and Northport cache controller are on the motherboard, along with eight expansion slots and enough SIMM sockets to hold a maximum of 64MB.

The system performed best on PC Magazine Labs' processor and disk tests but earned low performance points on video and memory routines. Club's video card was the slowest of the group, but boosting the card's RAM to 512K and 1MB significantly improved it. The multi-scanning Club 500A monitor worked at 800-by-600 noninterlaced resolution with a 66-Hz refresh rate—not quite the 72 Hz that allows flicker-free operation.

Memory performance is another matter. The direct-mapped, write-back cache design as implemented by the Northport controller slowed down the Falcon 386/40's memory score, as in several other systems. But you can easily improve memory performance by expanding the standard 64K 15-ns. cache to 256K.

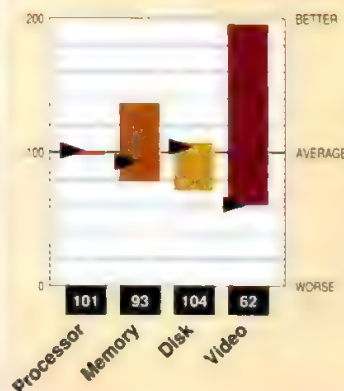
The Falcon 386/40's AT desktop de-

Club Falcon 386/40



In Short: Neither the best nor the worst of the Am386/40-based systems reviewed here, the upgradable Club Falcon 386/40 offers acceptable computing, service, and support at standard pricing. The system's processor card is one of six 80386 and 80486 options offered by the company. The Falcon's poor video and below-average memory test results are its low points, but company reliability, a wide variety of options, and easy upgrades are its strengths.

TEST RESULTS





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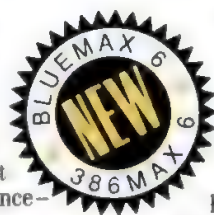
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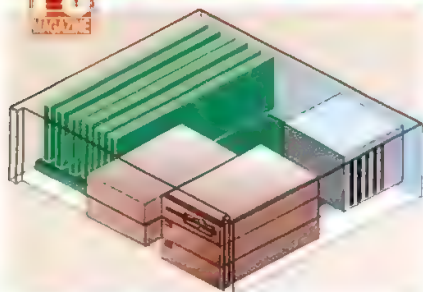
The Intelligent Memory Managers[™]

© 1991, 1992 Qualitas. Qualitas, 7101 Wisconsin Avenue, Suite 1386, Bethesda, MD 20814. All company and product names are trademarks or registered trademarks of their respective owners. System Requirements: Any 386 or 486 PC or PS/2, min. 256K of extended memory, DOS 3.0 or higher, and hard disk drive. *386MAX supports 286 systems with Shadow RAM. Feature availability and memory recovery may vary. **Offer valid in North America only.

QUALITAS



FACT FILE

**Club Falcon 386/40**

Club American Technologies Inc., 3401 W. Warren Ave., Fremont, CA 94539; 415-683-6688.

List price (tested configuration): \$2,695.

Memory and processor RAM cache: 4MB 70-ns. SIMMs, 64K cache.

Disk drives and controller: Maxtor 15-ms. 213MB IDE hard disk, 1.2MB floppy disk drive.

Display: Club 1,024-by-768 adapter with 256K RAM, Club 14-inch multicasting monitor.

Monitor refresh rate: 66 Hz.

Software: DOS 5.0, Microsoft Windows 3.0.

CIRCLE 406 ON READER SERVICE CARD

sign offers enough space for three external-access bays and two half-height internal bays. Club lists a number of drive and controller options besides the 15-millisecond 213MB Maxtor IDE-type hard disk we tested, with hard disks ranging from a \$279 52MB Quantum disk to a \$895 340MB Maxtor unit. Club also offers internal Wangtek tape and NEC CD-ROM drives. A standard DTK combination IDE controller and I/O card comes with the Falcon 386/40, and Club sells Everex ESDI and Adaptec SCSI controller options for \$175 and \$399, respectively.

Should 386/40 processing power not suit you, a \$500 buy-back policy lets you upgrade your 386/40 processor card, at an added cost of \$250 for the 486SX/20, \$550 for the 486DX/25, or \$750 for the 486DX/33. But with the 386/40's fine processor speed and coprocessors selling for \$200, the cost of leaping to the 486 is not that enticing.

Service and support are the standard one year on parts and labor, backed by a 30-day money-back guarantee. On-site service from GE costs \$25 initially and may be extended for \$45 per year. A toll-free fax line and unlimited direct support give professional technical backup.

Club's system doesn't spike the power meter readings, and its warranty and extras are not going to make anyone jump and holler. But good pricing, an easy

upgrade path, and company reliability make the Club Falcon 386/40 a low-risk buying option.

CYBERMAX TECHNOLOGIES INC.

CyberMax 386/40

by Joseph Desposito

The CyberMax 386/40 is a difficult system to pass up. This aggressively priced machine scored above-average times on our disk, memory, and video benchmark tests. CyberMax Technologies, a two-year-old company that specializes in AMD Am386 systems, currently sells only one other PC, which is based on AMD's 386SX/25 chip. Unfortunately, the company falls a bit short on servicing its product.

For a price of just \$2,350 through mail order, the CyberMax 386/40 comes with 8MB of RAM, a 210MB Western Digital hard disk, 1.2MB and 1.44MB floppy disk drives, a Super VGA display, DOS 5.0, and Windows 3.0. The system also includes the Intel 82395-25 Smart Cache controller, a second-generation controller that offers 16K of cache RAM. Although Intel rates the 82395 at 25 MHz and does not warrant the part when it runs at 40 MHz, we experienced no problems. Indeed, the SmartCache controller was responsible for the excellent time this PC

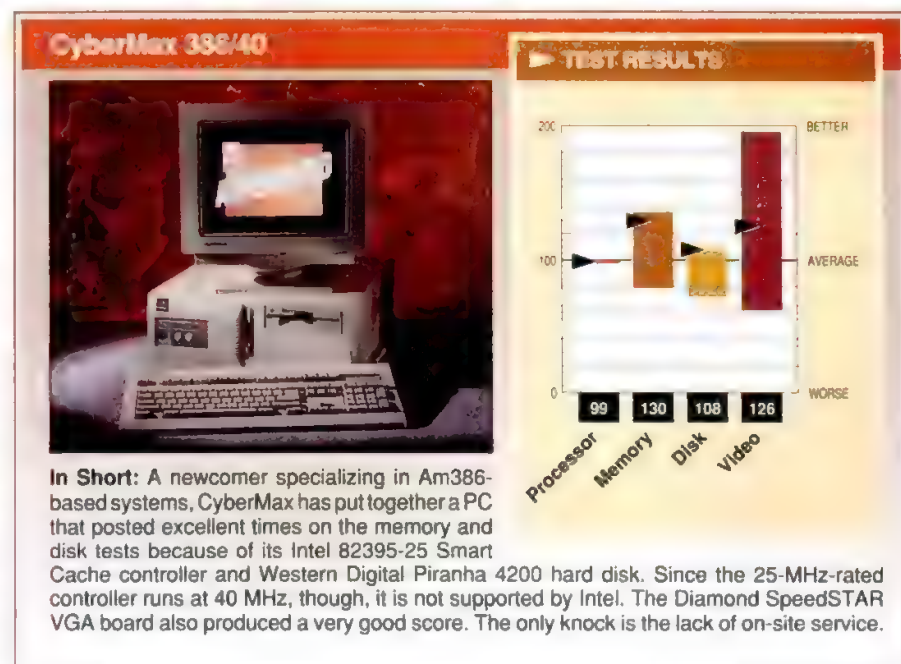
posted on our memory test.

Our review system shipped with a GoldStar 1460 Plus multiple-frequency monitor. The monitor's best Super VGA resolution, 800 by 600 at 56 Hz, is too flickery for Super VGA work, but a fast Diamond SpeedSTAR VGA board helped achieve very good performance on the video test. Based on the Tseng chip set, the board can provide up to 1,024-by-768 resolution at 70 Hz.

The hard disk included with the system is the Western Digital Piranha 4200. This IDE drive produced an excellent time on PC Magazine Labs' disk test.

CyberMax uses a Quadtel BIOS in its 386/40. Frequently found on notebook PCs, this BIOS may not be familiar on desktop computers, but its extensive setup program is powerful and easy to use. You can add a password, control the keyboard rate, change the state of the NumLock key upon boot-up, and implement a screen-saver feature.

The motherboard can hold up to 32MB



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1024 X 768 SVGA Adaptor
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101 Keyboard



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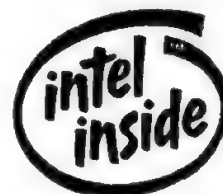
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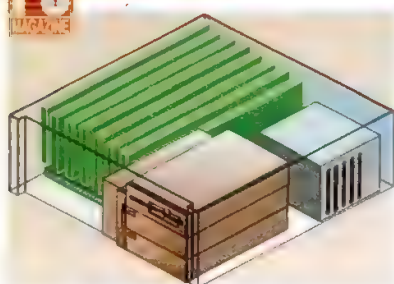


* Six Months Rental Rate

** Twelve Months Rental Rate



FACT FILE

**CyberMax 386/40**

CyberMax Technologies Inc., 981 U.S. Hwy. 22, #2000, Bridgewater, NJ 08807; 800-944-9499, 908-580-0111.
List price (tested configuration): \$2,350.
Memory and processor RAM cache: 8MB 80-ns. SIMMs, 16K cache.
Disk drives and controller: Western Digital 14-ms. 210MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.
Display: Diamond 1,024-by-768 adapter with 1MB RAM, GoldStar 14-inch monitor.
Monitor refresh rate: 56 Hz.
Software: DOS 5.0, Microsoft Windows 3.0, SMARTDRV.SYS.

CIRCLE 407 ON READER SERVICE CARD

of RAM in 4MB SIMMs, but you need to remove the original 1MB SIMMs to expand beyond 8MB. The SIMMs reside at the left front part of the motherboard, making them easily accessible when just a few boards occupy the expansion slots. With a full complement of boards, you have to remove some to get at the memory modules.

Video and I/O functions are handled by cards, which filled two of the eight 16-bit ISA expansion slots in the configuration we requested. Because the hard disk and I/O card interfered with access to one of our test unit's slots, only seven of the eight slots were fully accessible, leaving five open slots. But by moving the I/O card, we made room for a half-length card in the inaccessible slot.

The only real problem with the system is company support. CyberMax supplies a one-year parts-and-labor warranty and an 800 number for service and technical support. But on-site service is not yet available, although the company says it plans to offer TRW on-site, and the three support lines were often busy when we called.

The CyberMax 386/40 is certainly a system to consider. Its first-rate performance and low price make an unbeatable combination. If you need on-site support from the company, though, you will have to pass this one up.

ELTECH RESEARCH INC. Eltech Model 3400

by Patrick Honan

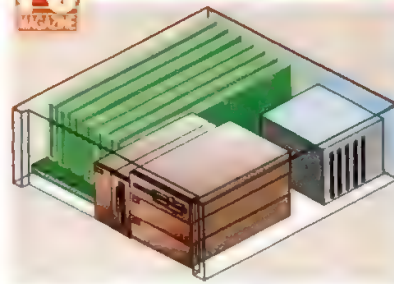
The well-designed Eltech Model 3400 has one major Achilles heel: performance. The 386/40 machine's comparatively poor showing on PC Magazine Labs' benchmark tests suggests that it is not well-suited for CAD, large spreadsheets, or other applications where speed is critical—at least not as well as other systems in this roundup. However, the Model 3400's low price, small footprint, strong expansion options, and FCC Class B certification make it worth considering as a home or office system for standard business applications.

In *PC Magazine's* standard configuration, a Model 3400 with 8MB of RAM, a 210MB hard disk, one floppy disk drive, a Super VGA display, and DOS 5.0 costs a modest \$2,439. The reviewed system, with a second floppy disk drive, sells for \$2,499. All configurations include Microsoft Windows 3.0 and a 64K RAM cache of 20-nanosecond static RAM.

The Model 3400 comes in a small-footprint desktop case measuring 6.5 by 16 by 16.5 inches (HWD). Eltech Research gets the most out of the internal space, and most users will find the expansion options more than adequate. The case contains three 5.25-inch drive bays



FACT FILE

**Eltech Model 3400**

Eltech Research Inc., 47266 Benicia St., Fremont, CA 94538; 510-438-0990.
List price (tested configuration): \$2,499.
Memory and processor RAM cache: 8MB 80-ns. SIMMs, 64K cache.
Disk drives and controller: Seagate 15-ms. 210MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.
Display: Puretek 1,024-by-768 adapter with 1MB RAM, Arche Technologies 14-inch monitor.
Monitor refresh rate: 72 Hz.
Software: DOS 5.0, Microsoft Windows 3.0.

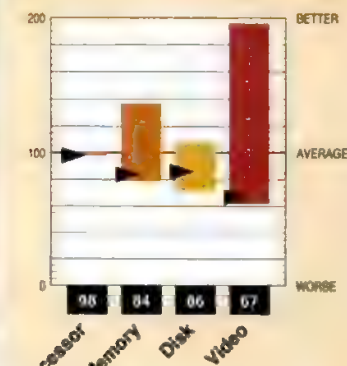
CIRCLE 408 ON READER SERVICE CARD

mounted horizontally and two vertical 3.5-inch bays. All five bays are accessible from the front of the machine. If you need more space, an extra \$60 buys a full-size tower case with ten drive bays.

The Eltech-manufactured motherboard uses an OPTi chip set and has built-in parallel and serial ports, along with built-in floppy and hard disk interfaces. This leaves all of the tested machine's seven 16-bit ISA slots open, except for one

Eltech Model 3400

In Short: The Eltech Model 3400's \$2,439 standard-configuration price and its small footprint make this an attractive personal system. It did poorly on the benchmark tests, however, and faster machines for the same or less money are available. The Model 3400 had the second-slowest times on the memory, disk, and video tests and the slowest time on the processor test. One key bottleneck on the reviewed machine is the 80-ns. RAM operating at one wait state.

TEST RESULTS

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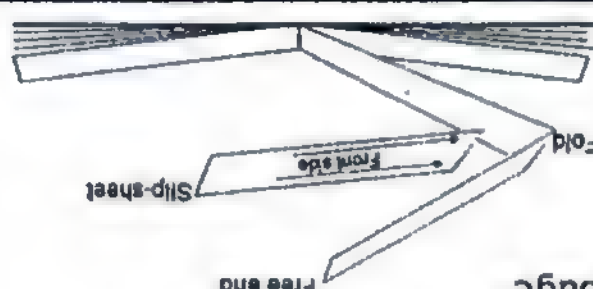
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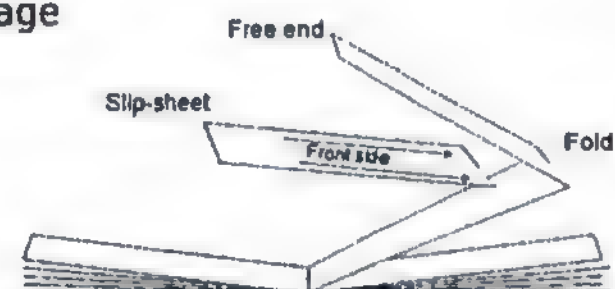
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Inverted Foldout slip-sheet



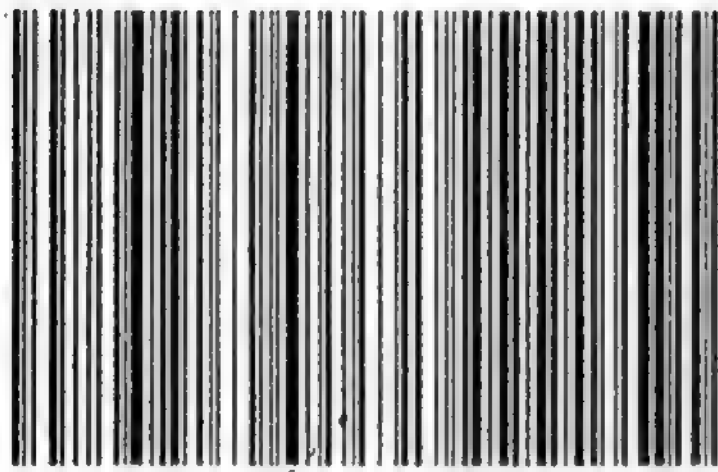
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1. Follow instructions on the other side

Inverted Back



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Back

1. Follow instructions on the other side

USUALLY, A



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- Super VGA color monitor (1024 x 768 resolution)

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- 16-bit VGA with 1MB
- Super VGA color monitor (1024 x 768 resolution)
- 1 parallel port/2 serial ports

- 101-key enhanced keyboard
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- 40MB IDE, 19ms hard drive*
- Paper white VGA, non-glare CCFT backlit LCD
- 640 x 480 resolution, 32 gray shades

- Supports an external VGA
- 1 parallel port/2 serial ports
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- Leather carrying case
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- 101-key enhanced keyboard
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- MS DOS 5
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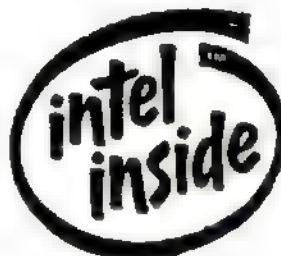
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- 16-bit VGA with 1MB
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The Eltech Model 3400
finished next-to-last
on the disk, memory,
and video tests and
last on the
processor test.

filled by a Puretek TVGA 9000 video board. You can install 32MB of RAM in SIMM sockets on the motherboard, and one of the seven slots accepts a 32-bit memory board for an additional 32MB. If you buy an 8MB system with 1MB SIMMs installed and decide to upgrade within six months, Eltech will exchange them for 4MB modules.

The machine's use of 80-ns. page-mode RAM operating at one wait state contributed to its next-to-last place on the memory test. Eltech also sells 70-ns. RAM operating at zero wait states but charges 10 percent more per megabyte.

The Model 3400 also finished next-to-last on the disk and video tests and last on the processor test. Its Seagate IDE hard disk, with a rated access time of 15 milliseconds, took nearly 15 percent more time to complete our disk test than the average time generated by the PCs in this review. The Puretek TVGA 9000 video board with a Trident chip set also placed among the slowest. The multiple-frequency Eltech monitor is noninterlaced at 800-by-600 resolution and interlaced at 1,024-by-768, with a refresh rate varying from 56 to 72 Hz.

Eltech also sells similarly configured 33-MHz 386 and 20-MHz 486SX systems for \$2,205 and \$2,159, respectively. The Model 3400 comes with a comparatively brief 6 months of free on-site service from TRW, with extended coverage available at \$69 for 6 months, \$279 for 18 months, and \$499 for 30 months. Eltech backs the Model 3400 with a one-year parts-and-labor warranty and provides toll-free technical support weekdays from 8:00 to 5:30 P.S.T.

If the Eltech Model 3400 turned in better benchmark test times, it would be an excellent value. As it stands, you will find faster systems that offer the same small footprint and solid expansion options for approximately the same price.

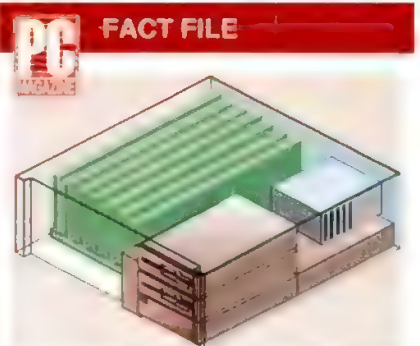
HYUNDAI ELECTRONICS AMERICA Hyundai Corporate Series 386/40

by Joseph Desposito

The Hyundai Corporate Series 386/40 offers two key features: an upgradable processor and the ability to expand motherboard RAM up to 64MB. Poor disk and memory performance, however, coupled with a high suggested price, make this PC difficult to recommend. Interestingly, this AMD Am386/40-based PC turned in considerably faster all-around scores than the same system with an Intel 486SX/20 module (*PC Magazine*, December 31, 1991).

In our standard configuration, the Corporate Series 386/40 came equipped with 8MB of RAM, a 64K external RAM cache, a 200MB Conner hard disk, 1.2MB and 1.44MB floppy disk drives, a Super VGA card and display, and DOS 5.0. Despite the system's suggested \$4,545 price, its 14-inch Hyundai monitor proved disappointing. This multiple-frequency model reaches a maximum refresh rate of only 56 Hz in Super VGA mode, noninterlaced.

The Corporate Series 386/40's chassis uses a snap-together construction held together with one screw, making it easy to

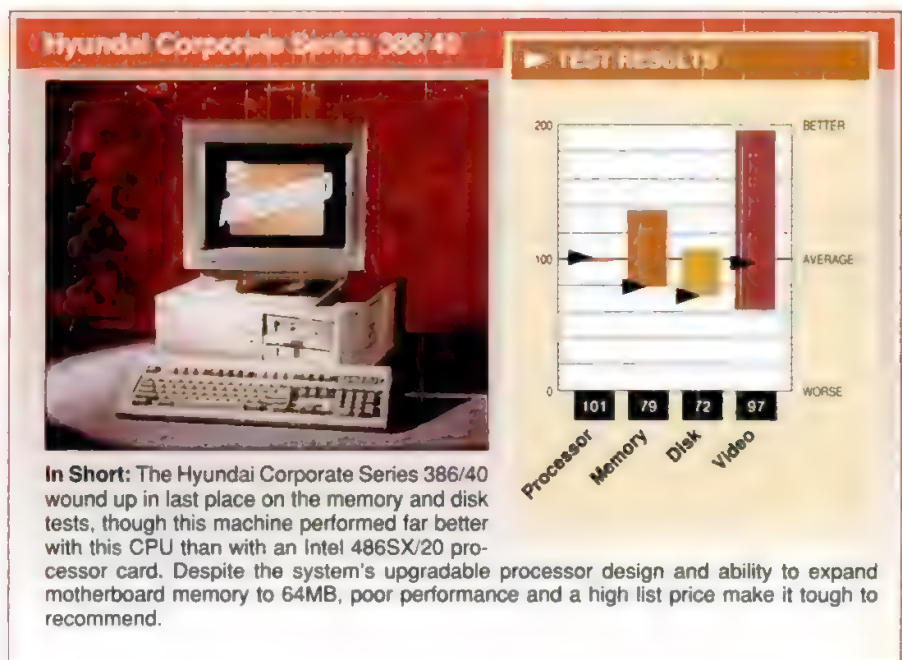


Hyundai Corporate Series 386/40
Hyundai Electronics America, 166 Baypointe Pkwy., San Jose, CA 95134; 408-473-9200.
List price (tested configuration): \$4,545.
Memory and processor RAM cache: 8MB 80-ns. SIMMs, 64K cache.
Disk drives and controller: Conner 16-ms. 200MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.
Display: ATI 1,024-by-768 adapter with 1MB RAM, Hyundai 14-inch monitor.
Monitor refresh rate: 56 Hz.
Software: DOS 5.0, Microsoft Windows 3.0.

CIRCLE 408 ON READER SERVICE CARD

snap off the top panel to get inside the computer. The tricky part is locating the hard disk; Hyundai tucks it underneath a screwed-down power supply. You can mount an additional hard disk to a bracket attached to the left side of the floppy disk drive bays.

The Motherboard Factory motherboard is somewhat similar to the one in the Northgate system reviewed here. On both, the chip set contains two chips from VLSI Technologies and a cache controller chip



COMPUTERS

40-MHz AM386-BASED PCs

from Northport. Like other computers using the Northport chip, both machines posted a poor result on PC Magazine Labs' memory test. In contrast, the Hyundai PC's motherboard offers seven 16-bit ISA expansion slots, compared to three 16-bit and two 8-bit slots on an expansion tree in the Northgate system. And the Corporate Series 386/40's motherboard lets you expand memory up to 64MB by adding 16 4MB SIMMs, while the Northgate

only allows a maximum of 32MB on its motherboard.

The Hyundai Corporate Series line includes three models: a 386/40, 486SX/20, and 486/33. Each uses a different processor module; they are otherwise the same. The processor module fits into a proprietary slot on the motherboard and includes either an AMD or Intel processor, a socket

The Hyundai Corporate Series 386/40's video ran twice as fast as the Hyundai 486SX/20 with the same setup.

for an Intel or Weitek coprocessor, and a 64K static RAM cache. The 386/40's SRAM chips are rated at 15 nanoseconds. You can upgrade the cache RAM to 256K.

The 486SX/20 upgrade module lists for \$1,215 and the 486/33 for \$1,695. Compare this with the machine prices: A comparably equipped Corporate Series 486SX/20 lists for just \$200 more than the 386/40, while the comparable 486/33 model costs \$1,400 more. If you anticipate upgrading to a 486SX, it's a good idea to pay the extra \$200 now rather than spend \$1,215 later.

If processor, memory, and video performance is what you want, though, the Corporate Series 386/40 performs much better than the Hyundai Corporate Series 486SX/20. Among 386/40 units, however, the Corporate Series 386/40's Conner 3204 IDE hard disk turned in the slowest time on the PC Labs disk test. The ATI VGA Wonder XL card produced an average video test score, but more interesting was the fact that the Hyundai Corporate Series 386/40's video ran exactly twice as fast as the 486SX/20 with the identical setup.

Hyundai offers an 18-month warranty on parts and labor, a good deal. On-site service is a \$189 option from TRW. The Hyundai Corporate Series 386/40 may interest you if you want a system you can upgrade and expand as the need arises. But the machine's generally poor performance and high price tag will probably encourage you to look elsewhere.

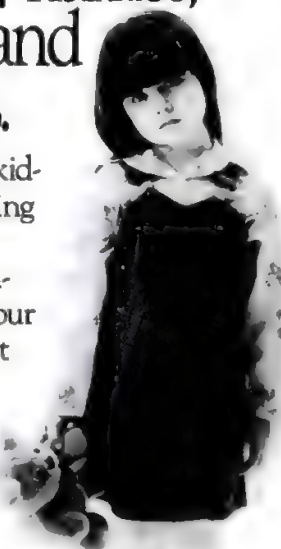
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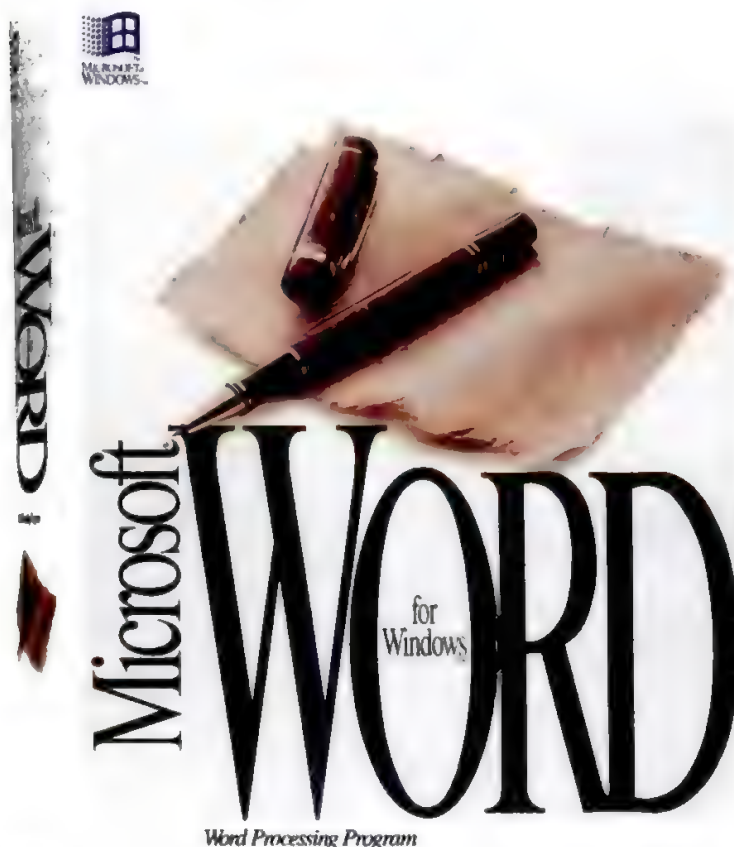
INTELEC

Intelec INT 386-40

by Bruce Brown

Price means a lot, but it isn't everything. The Intelec INT 386-40 costs less than most competing 386/40 systems, but its lack of standard or optional on-site service and inconsistent benchmark test performance may give you pause. To a lesser extent, you may wonder about its relatively unfamiliar motherboard and chip

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COMPUTERS

40-MHz AM386-BASED PCs

set, and the fact that Intelec currently sells only this model.

The INT 386-40's \$2,350 price for our standard configuration certainly is attractive. It includes 8MB of RAM and a 64K

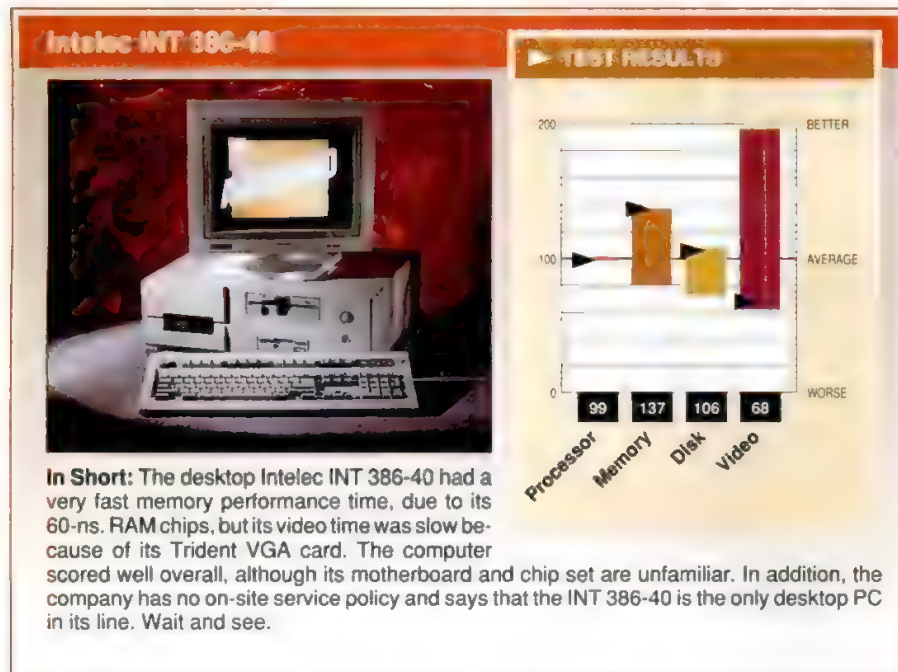
RAM cache, a 210MB hard disk, 1.2MB and 1.44MB floppy disk drives, a SuperCom SV1485 multiscanning monitor and

a Trident video card, DOS 5.0, Microsoft Windows 3.0, and a Logitech two-button mouse. The Supercom monitor's refresh rate ranges from 56 to 60.3 Hz at 800-by-600 resolution and 87 Hz in interlaced 1,024-by-768 mode.

Price alone has to carry the weight for deciding in favor of the INT 386-40, with its somewhat unfamiliar assortment of parts. The motherboard is manufactured by Premio Data and uses a chip set from ETEQ, both relatively obscure names. The ROM BIOS is from AMI, however, with the RAM cache-controlling circuitry built into the motherboard.

In addition to the desktop design we tested, Intelec sells the system in slimline and mini-tower cases. The desktop machine's fairly standard setup provides room for six storage devices (four accessible, for removable media). It accepts a maximum 64K of RAM if you replace the tested system's eight 1MB SIMM modules with 4MB units and add a \$45 memory expansion card that you have to populate with eight more 4MB SIMMs. Intelec sells optional memory for a flat rate of \$50 per megabyte.

Benchmark test performance was un-



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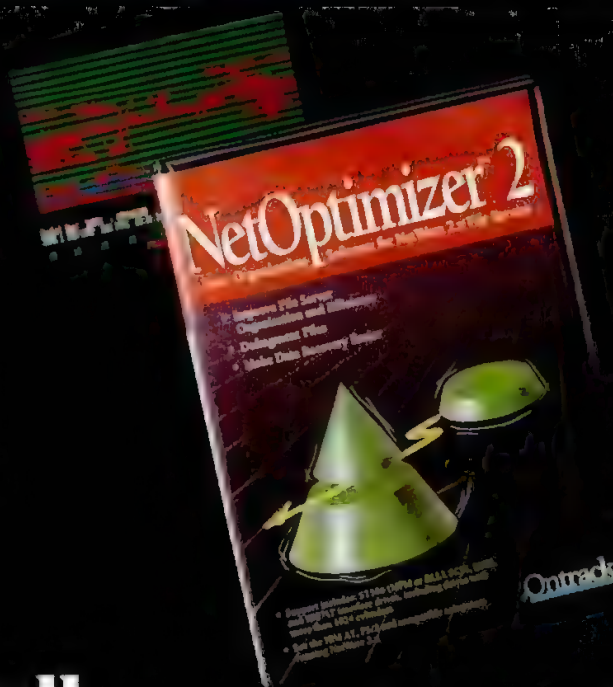
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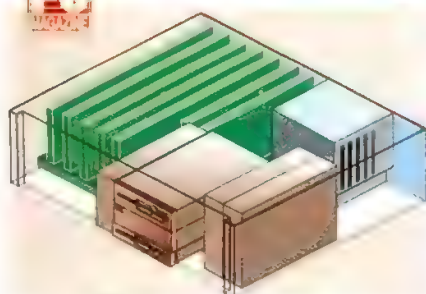
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FACT FILE



Intelec INT 386-40

Intelec, 6075 NW 82nd Ave., Miami, FL 33166;
800-683-0969, 305-477-9074.

List price (tested configuration): \$2,350.

Memory and processor RAM cache: 8MB
60-ns. SIMMs, 64K cache.

Disk drives and controller: Quantum 15-ms.
210MB IDE hard disk, 1.2MB and 1.44MB
floppy disk drives.

Display: Trident 1,024-by-768 adapter with
1MB RAM, Supercom 14-inch monitor.

Monitor refresh rate: 70 Hz.

Software: DOS 5.0, Microsoft Windows 3.0.

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even on this system. It turned in the fastest time on the memory test, probably because of its 60-nanosecond SIMMs (in addition to a 64K 20-ns. cache in a write-through, direct-mapped design), but its video time was the second-slowest. Most likely this was due to the Trident chip set on the Trident video card, a consistently poor performer on our video test. Drive and processor performance were about average for this test group.

The most notable part of Intelec's service-and-support policy is what isn't there. There is no standard or optional on-site service policy. While you can buy a private on-site contract elsewhere, it may affect your warranty and certainly is reason to pause when buying a system through the mail.

The rest of the service picture is fine, with a 30-day money-back guarantee; a one-year parts-and-labor warranty on the entire system, with two years on the hard disk and monitor; and free technical support via a toll-free number during business hours.

Even though the PC costs less than many competing systems, you should hesitate before buying the Intelec INT 386-40 without the reassurance of an on-site service contract. If you're not dissuaded by the lack of on-site service, inconsistent performance, and relatively obscure parts, then go ahead, but consider adding a faster video board.

COMPUTERS

40-MHz AM386-BASED PCs

MICRO EXPRESS INC.

Micro Express ME 386-40

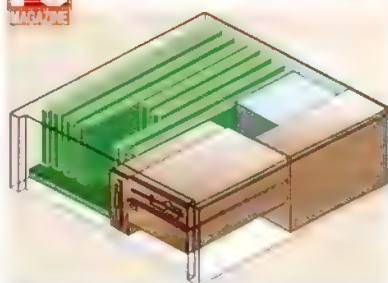
by John R. Quain

Direct marketer Micro Express will have a tough time convincing buyers that there's any gold in its ME 386-40. This PC is not the most sophisticated, least expensive, or fastest of the AMD Am386-based systems in this roundup. On PC Magazine Labs' benchmark tests, the \$2,959 Micro Express ME 386-40 with DOS 4.01 set a slow disk time and proved awkward to upgrade.

Micro Express has squeezed a full-size ISA AMI 386 Mark IV 40-MHz Screamer motherboard into a small-footprint 6.5-by-16.1-by-16.5-inch baby case. Rather than using an integrated chip set, the motherboard relies on an AMI BIOS, a single Chips and Technologies controller, and discrete logic to run a 64K 20-nanosecond static RAM cache and board-level functions. The Am386 processor showed no signs of falling behind the rest of the competition on PC Labs' benchmark tests, but the discrete-logic-controlled write-back cache design took more than 50 percent longer than the fastest memory times. To improve memory performance, you



FACT FILE



Micro Express ME 386-40

Micro Express Inc., 1801 Carnegie Ave.,
Santa Ana, CA 92705; 800-989-9900,
714-852-1400.

List price (tested configuration): \$2,959.

Memory and processor RAM cache: 8MB
70-ns. SIMMs, 128K cache.

Disk drives and controller: Western Digital
16-ms. 202MB IDE hard disk, 1.2MB and
1.44MB floppy disk drives.

Display: Micro Express 1,024-by-768 adapter
with 1MB RAM, CTX 14-inch monitor.

Monitor refresh rate: 70 Hz.

Software: DOS 4.01.

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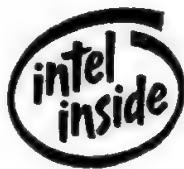
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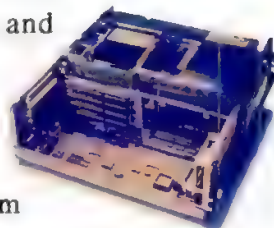
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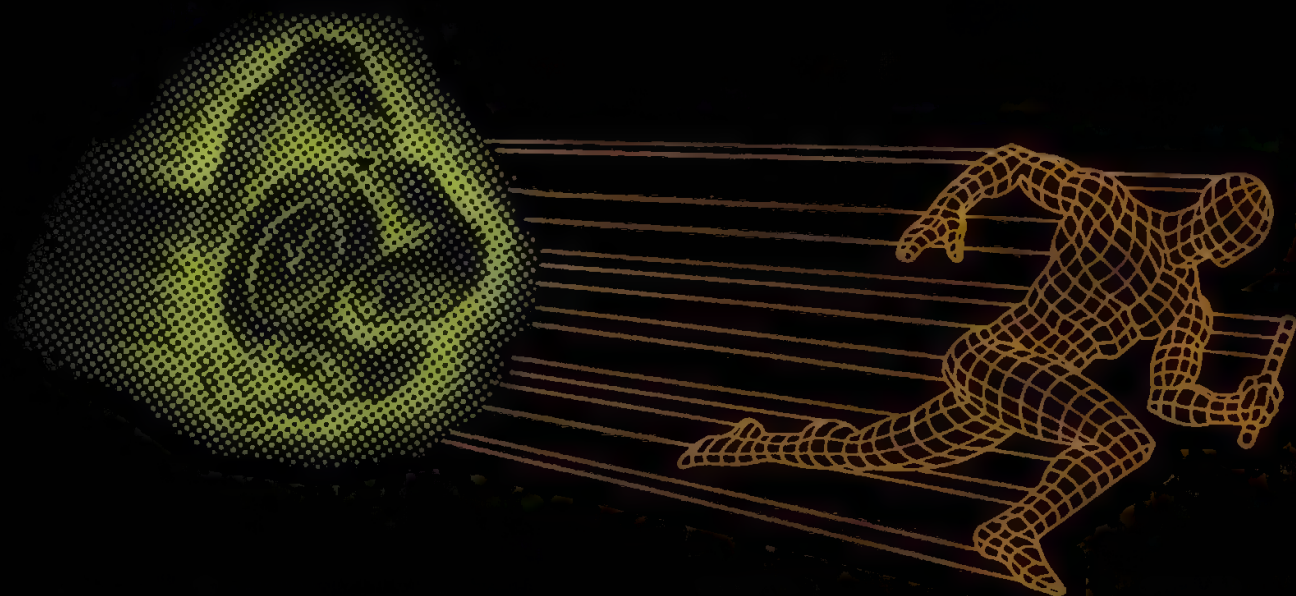


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Instruction	Math•Co	Intel
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MPY	12	17
DIV	40	77
SQRT	37-41	97
REM	68-72	81

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ULSI
SYSTEMS

can increase the cache to 256K (\$200). A small interface in the center of the board holds the promise of future processor upgrades when they become available, but Micro Express could report no specifics at this time.

The benefit of the baby case is more desktop space outside; the drawback is cramped quarters inside. If you want to add more memory to the 8MB of 70-ns. dynamic RAM, for example, you will have to remove the power supply and drive assembly. Though the motherboard can manage a total of 64MB of SIMMs, all 16 sockets are hidden beneath the power supply.

The Screamer motherboard will handle eight expansion cards: six 16-bit and two 8-bit cards. Because of a vertical 3.5-inch drive bay, two of the 16-bit slots can use only three-quarter-length boards. With the 16-bit video and IDE pass-through cards installed, six free slots remain. Punch-outs in the back of the case mean additional connections will not waste a slot, but connectors must be nimbly weaved between the power supply, memory modules, and drive connectors.

The ME 386-40 contains one vertically positioned 3.5-inch and two standard-height accessible drive bays. Micro Express installed two Y-E Data floppy disk drives (1.2MB and 1.44MB) and an internal 200MB Western Digital Piranha 4200 hard disk to meet *PC Magazine's*

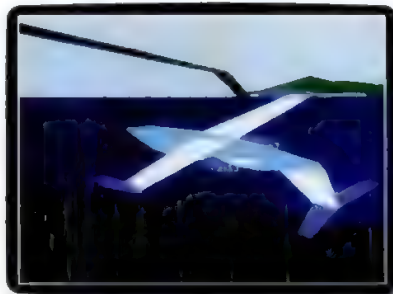
standard configuration requirements. Though there's room for an additional full-height internal hard disk, a front-panel power supply cable hampers access to the Piranha hard disk. In other machines in this roundup, the Piranha managed to achieve some of the fastest disk scores,

but it showed lukewarm performance in the ME 386-40, sinking this system's position to the bottom three.

In its favor, Micro Express's Tseng Labs ET4000-controlled Turbo video adapter posted better than average results on the video test. Fortunately, its performance was unimpeded by a patch and hand-soldered crystal on the adapter (Micro Express said subsequent versions would correct the patch). Equipped with 1MB of memory and a Sierra Hi-Color RAM DAC that can display 32,768 colors in Super VGA, the adapter is capable of only a 70-Hz vertical refresh rate. If you would rather get a flicker-free 72-Hz Super VGA refresh rate and forgo the 32,768 colors, Micro Express will substitute a 72-Hz board at no additional cost. But you will have to pay another \$50 to upgrade the supplied 14-inch CTX International CVP-5468 monitor. As it is, this multiple-frequency monitor is capable of 1,024-by-768 noninterlaced resolution.

Micro Express offers a welter of other options. Perhaps the best choice for overcoming the confines of the baby case is a tower case with a 375-watt power supply. Unfortunately, that adds another \$400 to the system price. To allay mission-critical nightmares, Micro Express has instituted

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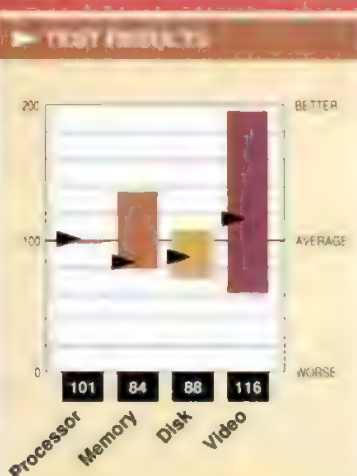
Microsoft

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Micro Express ME 386-40



In Short: Inside this small-footprint PC, there is a full-size motherboard screaming to get out. This makes for some expansion headaches in an otherwise unimpressive performer. The Micro Express ME 386-40's disk and memory test results were among the slowest. Also, with a direct-mail price of \$2,959, there will not be any discounted street price.



PC MAGAZINE
EDITORS CHOICE AWARD

IDEK

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March 26, 1991
Idek MF-5117

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Model	H. Frequency	Dot	Resolution
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MF-5121	21 to 50kHz	0.31	1024 × 768
MF-5221A	30 to 80kHz	0.31	1280 × 1280
MF-5321A (A/R Panel)	30 to 80kHz	0.31	1280 × 1280
MF-5421A (A/R Panel)	30 to 80kHz	0.26	1600 × 1280

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COMPUTERS 40-MHz AM386-BASED PCs

an automated fax service, in addition to its two-year warranty and toll-free technical support. But since the Micro Express ME 386-40 lacks any significant performance benefits outside of its 40-MHz CPU, most users would be well advised to continue looking.

NATIONAL MICRO SYSTEMS INC. **Flash 386-40C**

by Patrick Honan

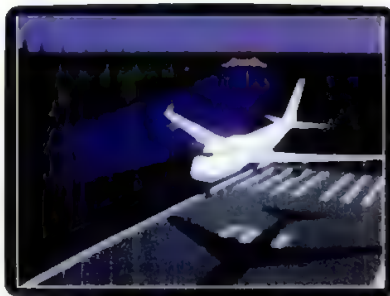
At a price of \$1,925 for *PC Magazine's* standard configuration of 8MB of RAM, a 200MB hard disk, one floppy disk drive, Super VGA video, and DOS 5.0, the Flash 386-40C rivals the price of 20-MHz 386SX machines. Is the price too good to be true? No, and the more you look into the machine, the more impressed you will be. It did well on *PC Magazine Labs'* benchmark tests, and it offers expansion options comparable to other systems that use a small-footprint case.

The review unit matched the standard configuration except for a second floppy disk drive, which raised the cost to \$1,975. To sell this machine for such a low price, National Micro Systems has had to cut a few corners—mainly in service and support, though, rather than in components or quality. For example, the company offers on-site service as a \$75 option from GE On-Site, rather than including it in the price. National Micro Systems also charges \$65 for Microsoft Windows 3.0 instead of bundling it with the system.

Economy was evidently a consideration in the design of the processor RAM cache. At 16K, the 25-nanosecond static RAM cache is about one-quarter the size you would find in other 40-MHz systems. However, the company says that the cache, with its four-way set-associative design, performs as well as most 64K caches. Its strong showing on the processor and memory tests tends to support this claim.

The Flash is the best buy among 386-based machines from National Micro Systems, offering the fastest performance yet costing only \$100 more than the standard configuration of the company's 386/33 system. As attractive as its price may be, however, the 486/33 system is an even better buy for those who need the utmost in processing power: With a 256K cache, a model matching the standard configura-

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tion sells for \$2,995. The company doesn't offer 486SX or 25-MHz 486 systems.

Options are a bit more limited inside the machine's 6- by 16- by 16.8-inch case than on some other small-footprint machines, but should still be adequate for most standalone users. Of the five drive

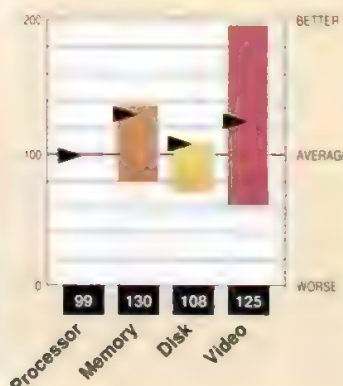
bays (three 5.25-inch and two 3.5-inch), all but one of the 3.5-inch are accessible, while other systems make all five bays accessible. Out of eight 16-bit ISA expansion slots, the Super VGA board and the I/O board filled two; six remained open in the tested machine. The Flash

Flash 386-40C



In Short: This PC's \$1,975 standard-configuration price rivals the cost of SX-based machines. The Flash 386-40C's benchmark test scores put it among the fastest systems we tested; it finished second on the memory and disk tests and tied for fifth on the video test. The processor time of 1.41 seconds was average, but just 0.03 seconds slower than the fastest time produced in this roundup. At less than \$2,000, the Flash is also among the least expensive systems in this group.

TEST RESULTS

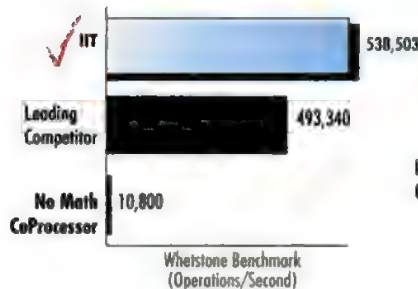


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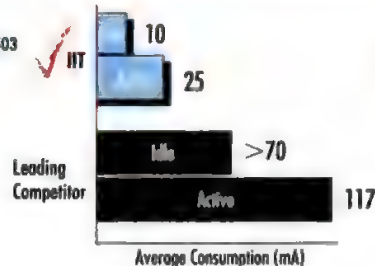
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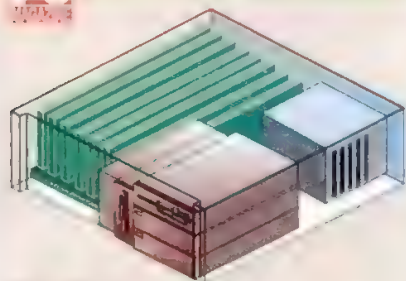
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FACT FILE

**Flash 386-40C**

National Micro Systems Inc., 2979-B Pacific Dr., Norcross, GA 30071; 800-642-7649.

List price (tested configuration): \$1,975.

Memory and processor RAM cache: 8MB 70-ns. SIMMs, 16K cache.

Disk drives and controller: Western Digital 15-ms, 200MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Pixel Engineering 1,024-by-768 adapter with 1MB RAM, CTX 14-inch monitor.

Monitor refresh rate: 50 to 90 Hz.

Software: DOS 5.0.

CIRCLE 412 ON READER SERVICE CARD

can carry up to 32MB of RAM, all of it added as 4MB 70-ns. SIMMs to the motherboard, whereas several other small-footprint machines accept up to 64MB.

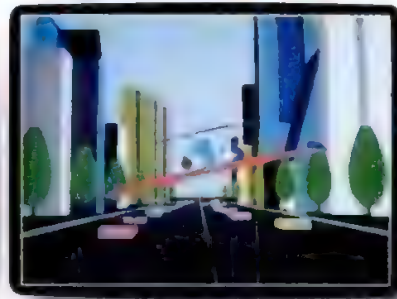
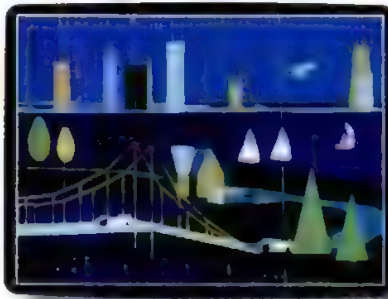
A low price didn't stop the Flash from holding its own against all comers on our benchmark tests. Its performance was fine on the processor test, where it placed solidly within average, and excellent on the memory test, where it came in just 0.01 second behind the fastest PC. Its score on our disk test was also the second-fastest, thanks to a 14-millisecond Western Digital IDE hard disk and a 64K buffer on the controller.

Video on the Flash is fast. The machine's Pixel Engineering Turbo 16 board, which can handle 1,024 by 768 interlaced and noninterlaced, scored 0.77 seconds—considerably faster than the 0.96-second average for this test. This video board, however, is matched with a 14-inch CTX International monitor that scans across a 50- to 90-Hz range, though it is not specified as a multiscanning monitor. It handles displays at 1,024 by 768 interlaced and 800 by 600 noninterlaced.

The warranty covers parts for 15 months and labor for 24 months. Toll-free technical support lines are open weekdays from 9:00 to 5:30 E.S.T.

National Micro Systems deserves praise for its pricing strategy: In the Flash 386-40C, it puts together the basics a user

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needs for as low a price as possible without skimping on performance or quality, then offers options such as on-site service at a fair price to those who want them.

NORTHGATE COMPUTER SYSTEMS INC.

Northgate Slimline SP 386/40

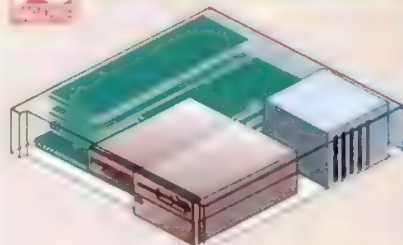
by Bruce Brown

A small case size, easy upgradability, and better-than-average performance on our video and disk benchmark tests make the Northgate Slimline SP 386/40 an attractive package. But don't jump for it unless you are sure it's a good fit: A fairly high price and limited drive expansion room take some of the edge off its appeal.

As configured for this review, the Slimline costs \$3,999, including 8MB of RAM, a 64K RAM cache, a 200MB hard disk, two floppy disk drives (1.2MB and 1.44MB), a Panasonic PanaSync monitor, DOS 5.0, Microsoft Windows 3.0, and a Microsoft mouse. Northgate Computer Systems used SMARTDRV.SYS disk caching software with this system.



FACT FILE

**Northgate Slimline SP 386/40**

Northgate Computer Systems Inc., 7075 Flying Cloud Dr., Eden Prairie, MN 55344; 800-548-1993.

List price (tested configuration): \$3,999.

Memory and processor RAM cache: 8MB 80-ns. SIMMs, 64K cache.

Disk drives and controller: Maxtor 15-ms, 200MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Super VGA motherboard circuitry with 512K RAM, Panasonic 14-inch monitor.

Monitor refresh rate: 60 Hz.

Software: DOS 5.0.

CIRCLE 413 ON READER SERVICE CARD

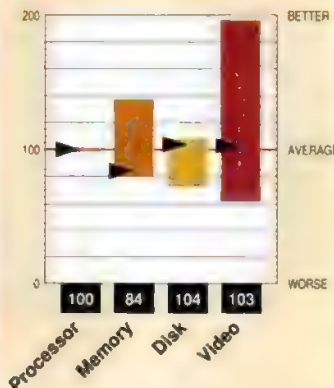
Upgradability is one of the Slimline's biggest selling points: Processor modules are available for the whole range of 386 and 486 CPUs. If you don't need the 486DX's math coprocessor or the 486

Northgate Slimline SP 386/40



In Short: The Northgate Slimline SP 386/40, at \$3,999, is no particular bargain unless you seek an upgradable PC with a very small case. Both the Hyundai and Northgate systems use the same motherboard and showed similar processor and memory characteristics, though the Slimline's 15-ms. Maxtor hard disk turned in substantially a quicker time than the Hyundai's 16-ms. Conner disk.

► TEST RESULTS



family's internal cache, the AMD Am386/40 processor unit is a good buy within the Northgate line—though priced somewhat high compared with systems from other mail-order vendors. A Slimline fitted with an Am386/40 costs the same as one with an Intel 386/33. In the 486 world, our test system configured with a 486DX/33 costs \$230 more, or \$4,229.

The Northgate system's edge over the competition is its case size and processor upgradability. Inside you can fit three conventional drives: two that take removable media and one 1.2MB internal drive. The test system came with two Toshiba floppy disk drives, one 1.2MB and one 1.44MB. Northgate also promises it will soon ship a new Canon dual-floppy disk drive combination that includes one drive in each floppy disk format and fits into one standard 5.25-inch slot, for about \$50 more than the current price of two separate floppy disk drives. That combo frees an extra 3.5-inch drive bay, which precludes CD-ROM drives but makes room for an extra hard disk or some tape drives.

Since the Slimline integrates all controllers and interfaces on the motherboard, the expansion tree in the test unit—with its three 16-bit and two 8-bit slots—was free and ready for add-in cards. All memory fits into eight 4MB SIMM modules located directly on the motherboard, with maximum configurable mem-

ory limited to 32MB. Exceeding the test system's 8MB of RAM requires replacing at least some of the current 1MB modules.

On PC Magazine Labs' benchmark tests, the Slimline's processor score was average for the group. The memory test result was among the slowest, while video and disk performance scores were faster than average.

Northgate's 386/40 system shines in the all-important area of customer service and support. In addition to a 30-day money-back guarantee, the system comes with a 12-month parts-and-labor warranty. NCR Corp., with more than 400 locations nationwide, supplies on-site service. Northgate's technical support is available 24 hours a day via an 800 number. If you can find the problem, the company will cross-ship the required parts so that you can be up and running the next day. Northgate's user manual, another great help for installing or replacing system components, is absolutely first rate, with near-photo-quality line drawings and very clear explanations.

You won't buy this system if you are looking for a low price, drive expansion room, or fast performance. But when you add the company's excellent service-and-support policies to the Northgate Slimline SP 386/40's easy upgradability and small demands for desktop space, you could come up with a buy order.

PC BRAND INC. PC Brand 386/40 Cache System

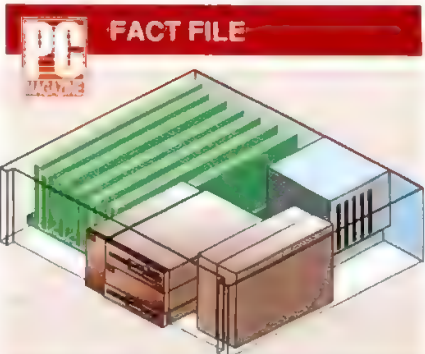
by Bruce Brown

If you're looking for a desktop 386/40 system with plenty of drive expansion room and good graphics capability, the PC Brand 386/40 Cache System gives you a lot of system for a reasonable price. A questionable and expensive service policy makes the deal less appealing, however.

Equipped in our standard configuration with 8MB of RAM, a 211MB hard disk, two floppy disk drives (1.2MB and 1.44MB), a CTX Super VGA monitor, an Orchid ProDesigner IIs video card, and DOS 5.0, the PC Brand system sells for \$3,075. The standard cache is 128K, upgradable to 256K of 20-nanosecond static RAM.

The Cache System case has room for six storage devices: Four can use removable media, and two can accept internal 1.2MB drives. Out of the seven expansion card slots, six take 16-bit ISA cards; the seventh can hold either a 16-bit ISA or a proprietary 32-bit memory expansion card.

The motherboard, built to PC Brand specifications, uses an OPTi chip set for processor support and to control the external RAM cache. Eight motherboard sock-



PC Brand 386/40 Cache System

PC Brand Inc., 877 Supreme Dr., Bensenville, IL 60106; 800-722-7263.

List price (tested configuration): \$3,075.

Memory and processor RAM cache: 8MB 60-ns. SIMMs, 128K cache.

Disk drives and controller: Seagate 15-ms. 211MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Orchid 1,024-by-768 adapter with 1MB RAM, CTX 14-inch monitor.

Monitor refresh rate: 70 Hz.

Software: DOS 5.0.

CIRCLE 414 ON READER SERVICE CARD

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MGA	\$1095	\$1295
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The most expandable 386 20MHz system you can buy! The 320sc's unique motherboard holds 32KB built-in cache memory to speed up data access, while the Hi-Res VGA controller, also built in to the motherboard, delivers incomparable video!

Monitor and Hard Drive Options

	40MB	80MB
320sc		
MGA	\$1495	\$1695
High-Resolution VGA	\$1795	\$1995

CompuAdd's newest stretch chassis, low profile system features the hottest innovation on the market: *local video*. Avoid the system bottlenecks of the AT-bus and achieve wait states-to-video memory equivalent to DRAM memory! **Now With 32K Cache!**

Monitor and Hard Drive Options

	40MB	80MB
325		
MGA	\$1795	\$1995
High-Resolution VGA	\$2195	\$2395

We've built the video on the local bus and stretched the chassis to two accessible 5.25" and two 3.5" internal bays, so you get the greatest expandability and flexibility available in a low profile system. The CompuAdd 333 also offers 128KB built-in cache memory — twice the industry norm!

Monitor and Hard Drive Options

	80MB	120MB
333		
MGA	\$2195	\$2295
High-Resolution VGA	\$2595	\$2695

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A true 32-bit 386 machine designed for power users. As a small business file server, a low-cost CAD machine or a multitasking workstation, it's unsurpassed. Built-in cache memory controller and hard drive options up to 200MB are available.

Monitor and Hard Drive Options

	40MB	80MB
325		
MGA	\$1895	\$2095
High-Resolution VGA	\$2265	\$2465

PC Magazine chose the 333 as a finalist in its Technical Excellence Awards. Two 16-bit expansion "hot slots" are provided for the HardCache/ESDI controller and Hi-Res VGA graphics card. Plug them in for spectacular data transfer and video performance! The optional 640KB SRAM card puts DOS and DOS-based applications into true 0 wait-state memory.

Monitor and Hard Drive Options

	80MB	120MB
333		
MGA	\$2595	\$2695
High-Resolution VGA	\$2985	\$3085

The expanded 32-bit EISA bus lets you access any memory or peripheral device installed on the system — regardless of bus width! Use your old 16-bit peripheral cards alongside new 32-bit EISA cards with no compatibility problems. A "hot slot" for the Hi-REZ VGA controller and a specially designed optional cache module move your data through at lightning speed.

Monitor and Hard Drive Options

	80MB	120MB
433E		
MGA	\$3195	\$3295
High-Resolution VGA	\$3585	\$3685

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COMPUTERS

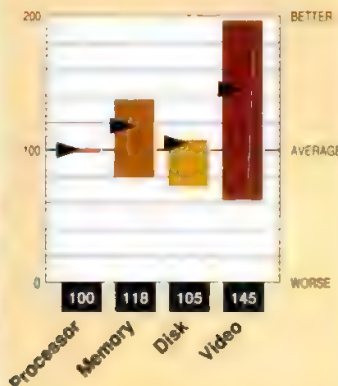
40-MHz AM386-BASED PCs

PC Brand 386/40 Cache System



In Short: The PC Brand 386/40 Cache System, with a standard 128K cache, turns in good performance scores, has room for drive expansion, and is reasonably priced. Its Orchid video card is excellent as well. PC Brand's five-year prorated warranty looks better on paper than in life, however, and an on-site service contract for the system we tested costs an additional \$300.

► TEST RESULTS



ets can take 256K, 1MB, or 4MB SIMMs. If you need more memory, you can buy an empty memory expansion card for \$149 and populate it up to 32MB.

On PC Magazine Labs' benchmark test suite, the Cache System's processor score was average, while both the disk and memory test scores were faster than average. This system really shines in terms of video performance. While the scores obtained using the Orchid ProDesigner IIs video board with 1MB of video RAM are impressive, PC Brand says it will soon offer an upgrade to the Orchid Fahrenheit 1280 board for an extra \$50. This board, which incorporates the S3 video coprocessor chip, greatly enhances graphics performance. The test system came with a 14-inch multiscanning CTX International monitor.

PC Brand also has an Intel-based line. Its 386/33, at \$2,975, costs \$100 less than the AMD Am386-based test system; a 486/25 is \$200 more; and a 486/33 is \$570 more. Unless you need the math coprocessor built into the 486DX, the clock speed of the Am386-based system makes it the fastest among these PC Brand computers.

Don't be fooled by PC Brand's five-year warranty. During the first year, all parts and labor are covered with free on-site service via TRW for only the first 90 days. For the remaining four years, parts only are also warranted, subject to a 20 percent prorated coverage decrease each

year; 80 percent of the parts cost is covered during the second year, 60 percent during the third year, and so on.

If you want to buy an extended warranty that includes on-site service, one-year coverage is available for 10 percent of the PC Brand 386/40 Cache System's cost, two-year coverage for 20 percent, and five years for 35 percent. (On our tested system, that would mean more than \$300 a year, or \$615 total for a two-year on-site package!) Either of these extended warranties must be purchased within 30 days of taking delivery of the system.

SIRIUS SYSTEMS TECHNOLOGY INC. **SST 386-40MWC**

by Patrick Honan

With its small-footprint case and strong performance on PC Magazine Labs' benchmark tests, the SST 386-40MWC deserves consideration as a personal system with enough speed to run standard business programs and some more-complex applications.

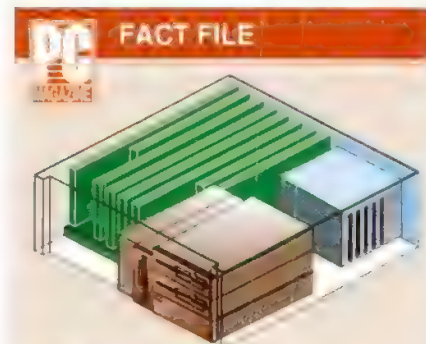
The standard configuration for this review includes 8MB of RAM, a 256K RAM cache, one floppy disk drive, a Super VGA display, and DOS 5.0. The reviewed \$2,995 machine matched this configuration and added a second floppy

disk drive, which raised the price \$70 over that of the standard configuration. Bundled software includes *Cache86*, a software disk cache, and *PreCursor*, a menu system, but not Microsoft Windows 3.0. A 64K RAM cache, adequate for many users, reduces the standard configuration price by \$165.

The styling and design of the 386-40MWC compare closely with those of other small-footprint systems. The case measures 6.5 by 16 by 16.5 inches and holds a complement of five drive bays: three 5.25-inch horizontal and two 3.5-inch vertical, all of which are accessible from the front. It runs on a 200-watt power supply. For \$175 more, you can order a tower case that holds eight 5.25-inch bays (five front-accessible), and a 300-watt power supply.

You can install up to 32MB of RAM on the motherboard using 70-nanosecond 4MB SIMMs and an additional 32MB by adding a memory board to the system's one 32-bit slot. The tested machine came with a 256K RAM cache of 20-ns. static RAM, which helped it perform well on our memory test. The 386-40MWC has eight slots: two 8-bit and six 16-bit, one of which can double as a 32-bit slot to hold the memory board.

The 386-40MWC performed well on all of PC Magazine's benchmark tests. It was one of the speediest on the processor test—just 0.01 seconds behind the



SST 386-40MWC

Sirius Systems Technology Inc., 4344 Young St., Pasadena, CA 77504; 800-424-0724

List price (tested configuration): \$2,995.

Memory and processor RAM cache: 8MB 70-ns. SIMMs, 256K cache.

Disk drives and controller: Conner 15-ms. 200MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: STB 1,024-by-768 adapter with 1MB RAM, CTX 14-inch monitor.

Monitor refresh rate: 50 to 90 Hz.

Software: *Cache86*, DOS 5.0

CIRCLE 415 ON READER SERVICE CARD

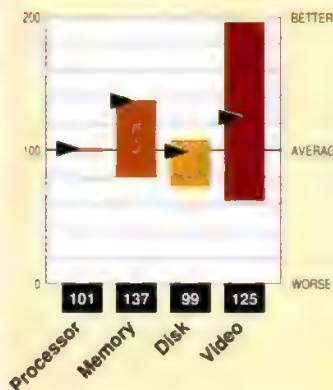
COMPUTERS 40-MHz AM386-BASED PCs

SST 386-40MWC



In Short: Sirius Systems Technology's SST 386-40MWC is a good value for less than \$3,000, packing solid performance in a small-footprint case. This system turned in fast processor and memory times, and its STB PowerGraph video board performed well, too. Its disk time was less than 0.5 seconds behind the average time, and its expansion options are similar to those of other small-footprint machines.

▶ TEST RESULTS



fastest—and tied for first place on our memory test. The 15-millisecond Conner 200MB IDE hard disk turned in an average score. On our video test, the 386-40MWC performed well, aided by an STB PowerGraph board with 1MB of video RAM and a Tseng Labs chip set. The monitor, a 14-inch CTX International capable of both interlaced and noninterlaced operation, had a maximum resolution of 1,024-by-768 and a refresh rate that ranges from 50 to 90 Hz, depending on the resolution.

Service, support, and the warranty are typical of what you will find with most mail-order systems. The warranty covers parts and labor for one year. The free on-site service for the first year is provided by Idea ServCom, a service contractor with 200 locations nationally. You can purchase a second year of on-site service for 10 percent of the system's purchase price. Toll-free technical support is available weekdays from 8:00 to 6:00 C.S.T.

Sirius Systems Technology's product line includes more- and less-expensive machines, and this system falls squarely between the company's 386/33 (\$2,850) and its 486SX/20 (\$3,200). Since the AMD Am386 chip consistently shows faster results than either Intel processor, this system is a good choice within Sirius's line. And compared to the whole group of Am386-based PCs, this small-footprint computer is a good value.

TANGENT COMPUTER INC. Tangent Model 340

by John R. Quain

Tangent Computer is one of the first manufacturers to ship its systems with a graphics accelerator video adapter as standard equipment. Including DOS 5.0 and Multisoft's *PC-Kwik Power Pak 2.0*, the \$3,295 Model 340 should relieve the graphics bottlenecks that can choke productivity. Though the Model 340 is among the more expensive 40-MHz AMD Am386DXL-based PCs in this roundup, Tangent justifies the price by delivering fast disk access and quality components.

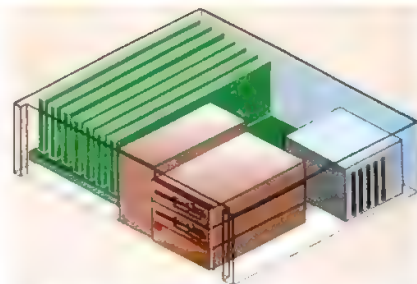
Based on a U.S.-made motherboard from Technology Power, the Model 340 incorporates a VLSI chip set, a Northport-controlled 64K static RAM cache (expandable to 256K), and an ISA expansion bus with seven 16-bit slots and one proprietary slot. Memory is packaged on the motherboard in 60-nanosecond 1MB SIMMs. The eight sockets will also accept 4MB SIMMs, but to get a full 32MB on the system board, you will have to swap out the memory. An optional \$175 memory board fits in the proprietary 8-bit/32-bit slot and will accept another 32MB of dynamic RAM. The motherboard will accommodate the Cyrix 40-MHz math coprocessor.

You will probably find the coprocessor unnecessary, though.

Though, Tangent has equipped the Model 340 with one of the first S3 graphics accelerator video adapters on the market, Actix Systems' Quantum VGA card. With 1MB of ZIP VRAM and a Sierra RAMDAC, it is capable of a 72-Hz vertical refresh rate and will display 32,768 colors in Super VGA and VGA resolutions, and 256 colors in 1,024-by-768 noninterlaced mode. More important is the graphics adapter's 86C911 GUI accelerator chip, made by S3. The S3 chip alleviates CPU overhead by performing hardware BitBlt and cursor functions, and by improving the speed of such graphics-intensive programs as Microsoft Windows 3.0.

Nevertheless, on PC Magazine Labs' standard VGA benchmark test, the Actix board generated disappointing results, producing one of the slower video scores in this roundup. But PC Labs' Windows benchmark tests, Release 1.1, demonstrated the S3 chip's benefits: in VGA mode, the Actix adapter outperformed the Editors' Choice-winning Video Seven VRAM II ("Super VGA Boards: Fast Enough for Windows, Cheap Enough for You," *PC Magazine*, September 24, 1991) and matched or bettered the Microsoft Windows performance of \$3,000 coprocessed video cards. To ensure that you'll see that performance, Tangent includes a

FACT FILE EDITORS' CHOICE



Tangent Model 340

Tangent Computer Inc., 197 Airport Blvd., Burlingame, CA 94010; 800-223-6677, 415-342-9388.

List price (tested configuration): \$3,295.
Memory and processor RAM cache: 8MB 60-ns. SIMMs, 64K cache.

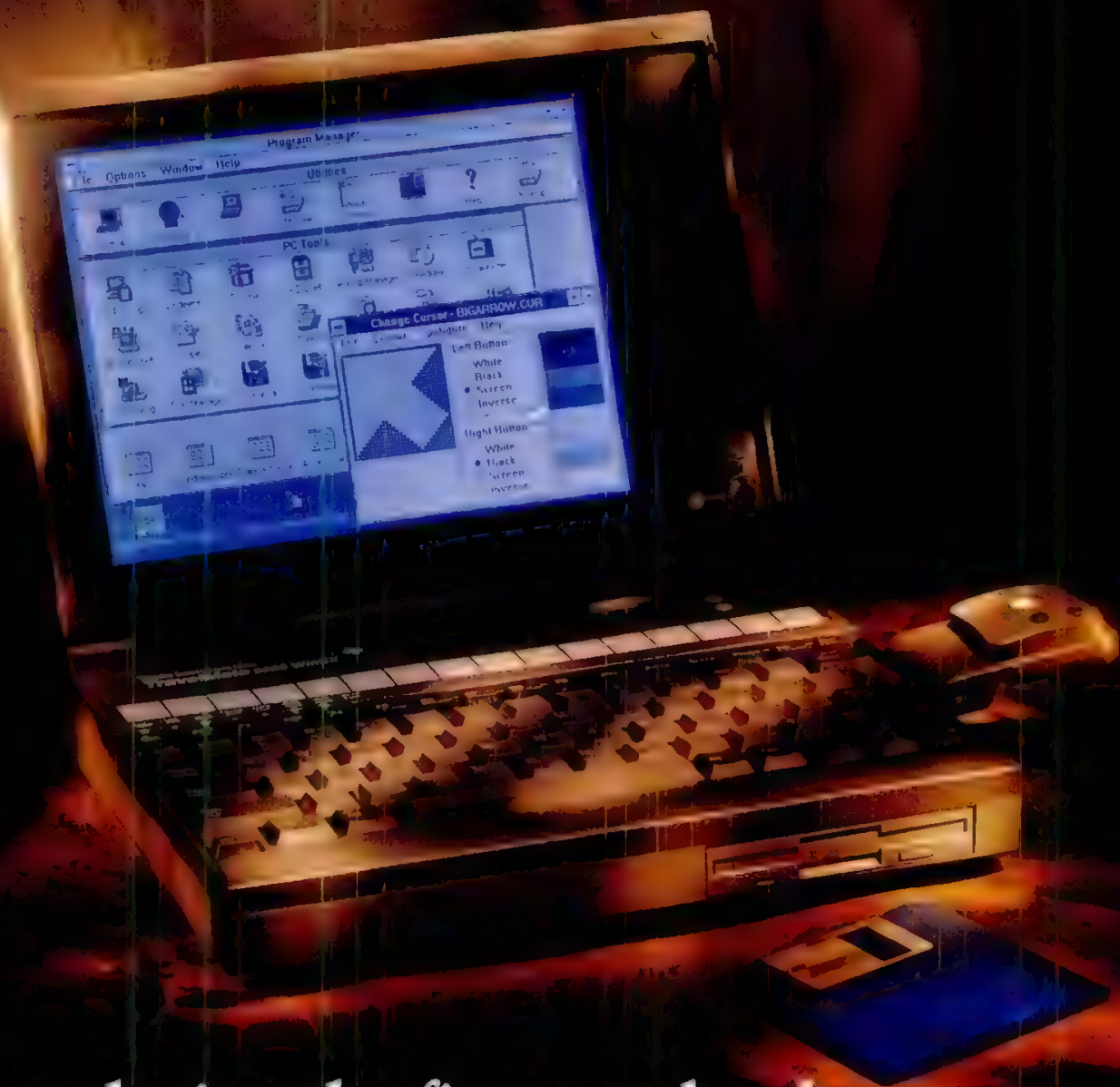
Disk drives and controller: Western Digital 15-ms. 202MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Actix Systems 1,024-by-768 adapter with 1MB RAM, Sampo 14-inch monitor.

Monitor refresh rate: 72 Hz.

Software: DOS 5.0, *PC-Kwik*, *Power Pak 2.0*.

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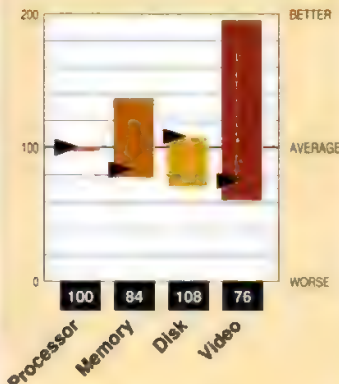
COMPUTERS 40-MHz AM386-BASED PCs

Tangent Model 340



In Short: Boasting a graphics accelerator chip as standard equipment, the \$3,295 Tangent Model 340 did not scroll past the competition on regular VGA tests. The real gains are in Microsoft Windows 3.0, where the Model 340 outperforms the quickest Super VGA boards and can match the speed of coprocessed adapters costing thousands more. Leading the disk race but trailing among memory scores, the Model 340 is for users looking for faster Windows performance.

TEST RESULTS



14-inch Sampo AlphaScan Plus display with a flicker-free vertical refresh rate of 72 Hz in Super VGA mode. This multiple-frequency monitor is capable of

1,024-by-768 noninterlaced resolution, though desktop publishing and CAD designers may be tempted to purchase a larger display.

Tangent also includes the same 202MB sub-16-millisecond Western Digital Piranha 4200 hard disk used by several other manufacturers in this review. The Model 340 managed to win the disk race by a nose, demonstrating that the jockey is as important as the horse. The memory test, on the other hand, saw the Model 340 slip in the standings. A Northport controller holds the reins on the system's direct-mapped write-back 15-ns. SRAM cache. Tangent says the cache should perform well in multitasking situations.

The company offers several storage options, including a \$3,500 2GB SCSI hard disk and a six-bay tower case for \$95.

Minor amenities are welcome features here as well. All I/O connections on the back are labeled, punch-outs on the back of the case allow for extra ports, and a quiet but solid KeyTronic keyboard comes standard. Direct-marketer Tangent ties the package up with toll-free technical support, a one-year warranty, free on-site service, and a 30-day money-back guarantee. If you're using Windows, or if you want to but found it too slow for your impatient nature, this may be the PC you have been waiting for.

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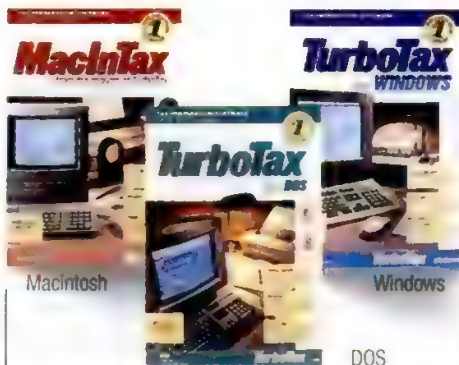
5 The Overlooked Deduction

You'd have to be a professional tax preparer to know all the deductions you're entitled to. If you miss just one, it could cost you hundreds of dollars.

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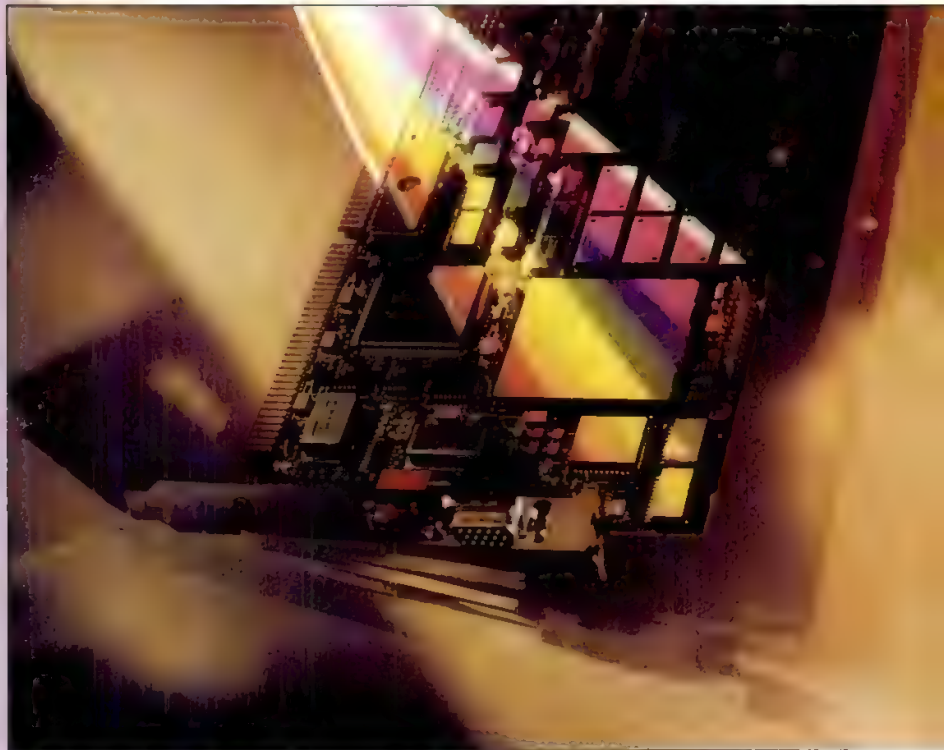
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24-Bit Graphics Adapters



TRUE COLOR And Plenty of Horsepower

Graphics applications can quickly find the weak spots in your system. If you are tired of on-screen dithering, you may be ready for 24-bit true-color boards. They can display 16.8 million colors, and most come with fast coprocessing. But will they run your software?

by James Kamey

VGA and Super VGA boards clearly have their limits. They are fine for most text-based applications and may even be enough for the Microsoft Windows user who is running *Ami Pro* and *Microsoft Excel*. But VGA is unable to meet the demands of the newest, most sophisticated graphics programs. The future is knocking on the door: 24-bit true-color video boards combine image quality that rivals color photography with enough processing power to handle the most

demanding CAD and desktop publishing applications.

The new true-color adapters transform the process of working with color images the way gray-scale technology transformed monochrome applications. Twenty-four-bit color boards can display approximately 16.8 million colors—about as many as the human eye can distinguish. The result is scanned images displayed with continuous tones and near-photographic quality, illustrations free of the posterizing often found in VGA renditions, and cleaner bitmapped images with better contrast and more saturated colors.

As enticing as it may sound, the ability to work with 16.8 million glorious colors does not come cheap. Most of these boards have prices reckoned in thousands rather than hundreds of dollars, and most require a monitor (such as the popular NEC MultiSync 4D) able to operate at a noninterlaced resolution of 1,024 by 768 pixels or higher.

You will only be able to exploit the boards with a handful of applications. Most software—like word processors and spreadsheet packages—won't look much different in 24-bit color than in Super VGA.

On the other hand, for those involved in advanced desktop publishing, electronic photography and image editing, graphics design, and multimedia presentations, 24-bit color is opening up new worlds. Powerful applications such as *Aldus PhotoStyler* and *Ventura Publisher*

*The ability to work
with 16.8 million
colors does not
come cheap. Most of
these boards cost
thousands of dollars.*

4.0 are exploiting the capabilities of 24-bit color, enabling us to do the kinds of work on our PCs that were formerly the exclusive province of commercial printers, photo retouchers, and video technicians. This kind of work calls for a true-color display adapter—a good one.

HOW 24-BIT ADAPTERS WORK

Standard VGA is a 4-bit technology; that is, it uses a 4-bit video "word" to specify the color of each pixel on-screen. It does this by assigning a specific, predefined color to each of the 16 numbers that can be described with 4 binary bits. The VGA adapter then uses a device called a digital-to-analog converter (DAC) to translate the numbers into signals that drive the monitor. In effect, VGA paints by the

numbers: "Make this pixel color number 11, this one color number 6," and so on. This numbering scheme is referred to as *indexing*.

Super VGA operates on the same principle but ups the ante by using an 8-bit video word, which makes 256 colors possible. Because they can only display such a small number from the possible spectrum of colors, VGA adapters resort to *dithering* (using patterns of available colors) to simulate unavailable colors and gradual shifts of tone, producing a rough approximation of realistic color at best.

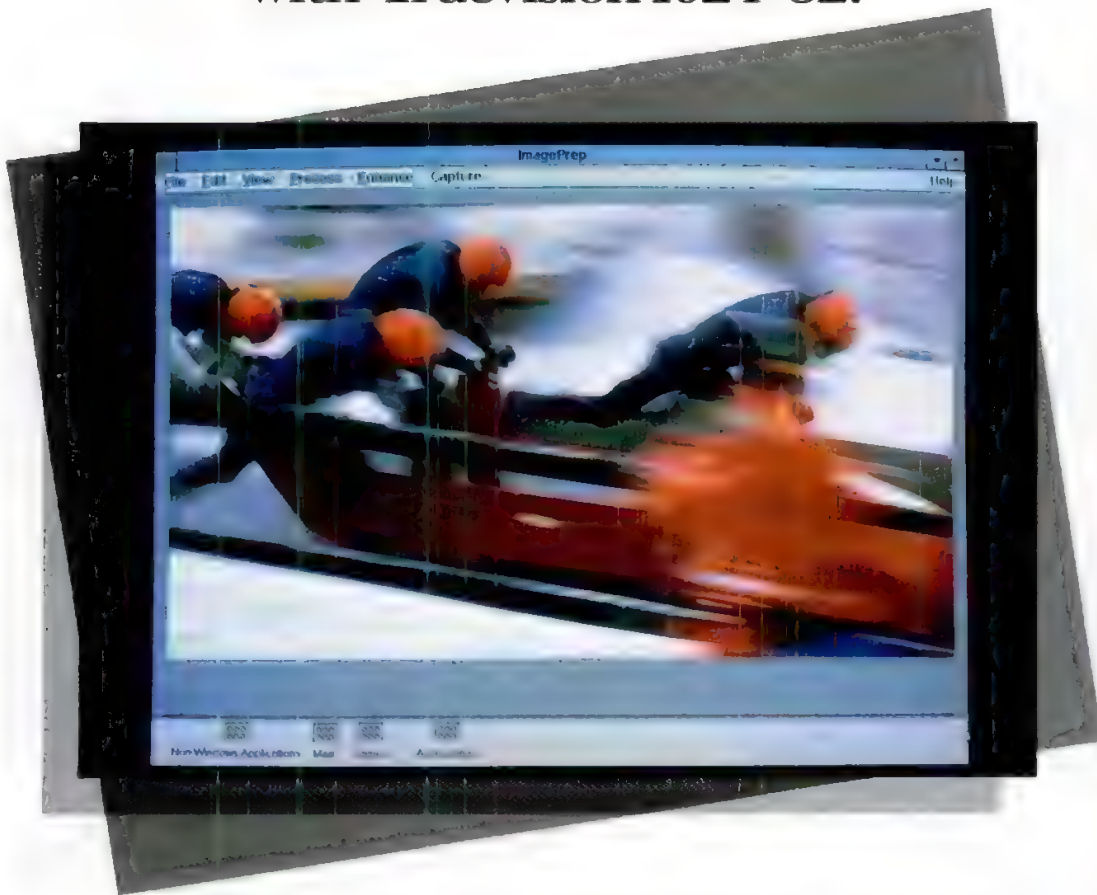
The 24-bit approach to digital color is somewhat different: With a 24-bit word, each of the image's three color channels (red, green, and blue) gets its own 8-bit byte. Thus, 24-bit technology can define the color of each pixel by specifying one of 256 possible intensities for each of the three primary colors. Add up all the possible combinations and you have nearly 16.8 million colors (16,777,216, to be exact). Since this is about as many shades as the human eye can distinguish, 24-bit digital color can come pretty close to duplicating the smooth shading and contrast of color photography.

Between the worlds of VGA and true color lies the realm of "high" color. The 15- and 16-bit adapters of this type also provide three color channels, but with fewer bits per pixel, they display fewer colors than 24-bit products. A 15-bit adapter (such as those using the Sierra HiColor RAMDAC) can generate 32,768



These two screens show the difference between 16-bit and 24-bit color for a graphics-intensive application running under Microsoft Windows. Both screens were displayed on the MonaLisa 24-Bit Color Display Board, using different drivers for the 24-bit display (left) and the 16-bit display (right).

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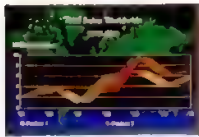
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GLOSSARY: 24-BIT GRAPHICS ADAPTERS

by Gayle C. Ehrenmann

alpha channel The upper 8 bits of the 32-bit data path in some 24-bit graphics adapters. The alpha channel is used by some software for controlling the color information in the lower 24 bits.

BitBlt (bit-block transfer) An operation in which the pixel data residing in one area of the frame buffer is copied to another area of the frame buffer or to system memory, and vice versa. By performing bit-block transfers, graphics coprocessors can dramatically improve video display speeds, since a displayed object is treated as one unit rather than as many individual pixels.

DAC (digital-to-analog converter) A chip that converts the binary numbers that represent particular colors to analog red, green, and blue signals that the monitor displays.

DRAM (dynamic RAM) The most commonly used type of memory, found on video boards as well as on PC system boards. DRAM is usually slower than video RAM (see entry below) since it has only a single data pathway.

frame buffer A large section of memory used to store an image to be displayed on-screen as well as parts of the image that lie outside the limits of the display.

graphics coprocessor A programmable chip that speeds video performance by carrying out graphics processing independently of the CPU. Among the coprocessor's common abilities are drawing graphics primitives and converting vectors to bitmaps.

interlaced display A display created by drawing images on-screen in two passes. The first pass draws the odd-numbered lines, while the second pass draws the even-numbered lines. Interlaced displays usually tend to flicker noticeably.

JPEG (Joint Photographic Experts Group) The image compression standard developed by an international committee of the same name. JPEG was developed to compress large still images, such as photographs, single video frames, or scanned pictures, to reduce the amount of memory required to store them. The standard awaits final ratification.

noninterlaced display The opposite of an interlaced display. All the lines are drawn in one pass rather than two, which reduces the appearance of flicker.

pass-through VGA A method of handling VGA display that passes a VGA signal from another graphics board through a cable attached to the high-resolution adapter and out to the monitor. Other methods of handling VGA include on-board VGA (where a VGA controller is mounted on the high-resolution board) and daughter-card VGA (where the VGA controller and memory reside on a small daughterboard that plugs into the high-resolution board).

RAMDAC (random access memory digital-to-analog converter) The chip on a VGA board that translates the digital representation of a pixel into the analog information needed for display on the monitor.

refresh rate (or vertical scan frequency) The rate at which the electron gun inside the monitor draws an entire screenful of lines from top to bottom—usually cited in cycles per second, or hertz (Hz). At lower refresh rates, you are more likely to notice screen flicker.

VRAM (video RAM) Memory used to buffer an image and transfer it onto the display. VRAM has two data paths—a technique known as dual porting—rather than the single path of traditional RAM; thus, it can move data in and out simultaneously, which speeds up screen drawing. ■

colors; a 16-bit adapter (such as IBM's XGA adapter), 65,536. While high color is certainly a big improvement over Super VGA, these technologies fall far short of producing the number of colors required for truly realistic rendering or other color-critical work.

The number of available colors is not the only difference between VGA and 24-bit color boards. How the two types of adapters handle their graphics processing—and how quickly—is another important issue, because with 24-bit color, there is a lot more information to process. By definition, there are 6 times as many bits per pixel, and since most 24-bit products are designed to work at higher resolutions, there are likely to be more pixels—lots more. A 1,024-by-768 24-bit screen has more than 15 times as much video data as a standard VGA screen (640-by-480 4-bit technology). Clearly, speed is an issue.

THE ROLE OF COPROCESSORS

A standard VGA adapter is essentially a "dumb" video controller that relies on the host computer's CPU to perform the actual processing. With VGA, the computer is responsible for knowing how to place every pixel on the screen. Sophisticated color boards tend to have graphics coprocessors or similar components to handle the bulk of the graphics data manipulation that a standard VGA board leaves to the host computer.

Most current 24-bit color board designs (including several of the products we review here) utilize the Texas Instruments 34020 coprocessor, a fully programmable 32-bit microprocessor optimized for graphics data. The TI 34020 is more flexible than simple accelerators (such as XGA and 8514/A chips) that can support resolutions greater than 1,024 by 768 and the fast screen refresh rates required to avoid flicker.

A radically different approach, used in BleuMont's Truc, is to provide three Western Digital 8514/A controllers, one for each color channel. The 8514/A accelerator is not a true coprocessor because it's not programmable, but it does have the ability to handle basic drawing functions and to manage fonts. This makes for quick screen drawing in graphics environments such as Windows, but 8514/A technology is limited in the resolution and monitor refresh rates it can deliver.

Another way 24-bit color boards speed performance is through VRAM

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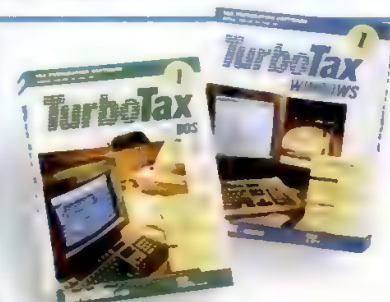
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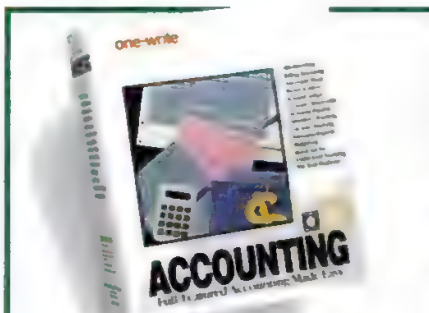
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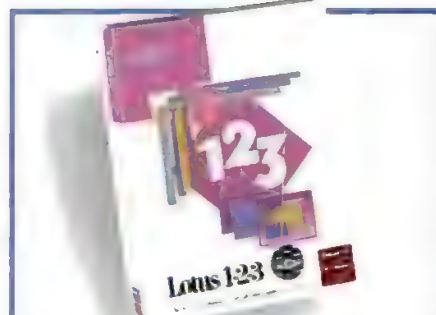
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- 8380 BasicVGA (256K, 640 x 480) ... 63.
- 8381 SuperVGA (1 MB, 1024 x 768) ... 145.
- 3859 2400 Internal Modem ... 85.
- 3860 2400 External Modem ... 109.

Bravo Communications ... 2 years

- 7400 2 Position Laser Compatible Switch Box. 109.

Brown-Wagh ... 1 year

- 8578 Creative Labs Sound Blaster ... 115.
- 2336 Creative Labs Sound Blaster Pro ... 189.

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- 8158 Typist Plus Graphics ... 389.

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- 7897 BubbleJet Ink Cartridge (BJ-10ex) ... 23.
- 7896 BJ-10ex Sheet Feeder ... 75.

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- 2719 MB2296SR Internal Send/Receive Fax ... 109.
- 2721 VGA732 True Color Ultra VGA Card ... 175.
- 4124 VGA742 True Color Ultra VGA Card ... 199.

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7782	SatisFAXtion (fax board) 389.
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2343	Trackman Portable 105.
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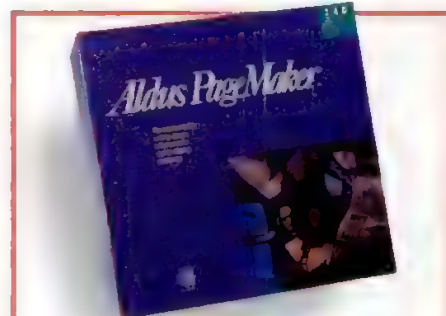
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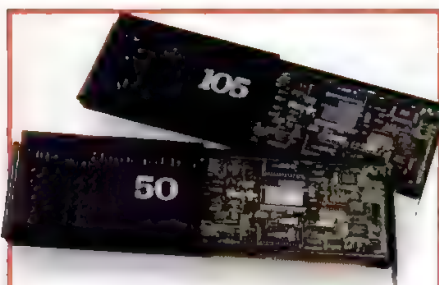
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4951	720k Drive for PC/XT (3 1/2")	69.
6951	1.2 MB Drive for AT (5 1/4")	75.

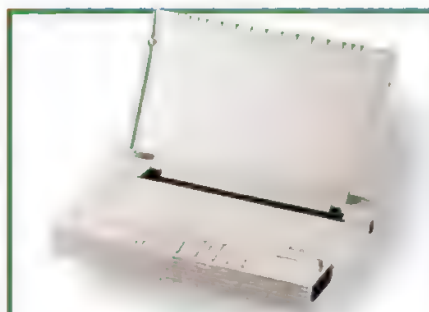
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3297	3 1/2" DS/DD 720k Diskettes (Qty. 10)	9.
3298	3 1/2" DS/HD 1.44 MB Diskettes (Qty. 10)	16.

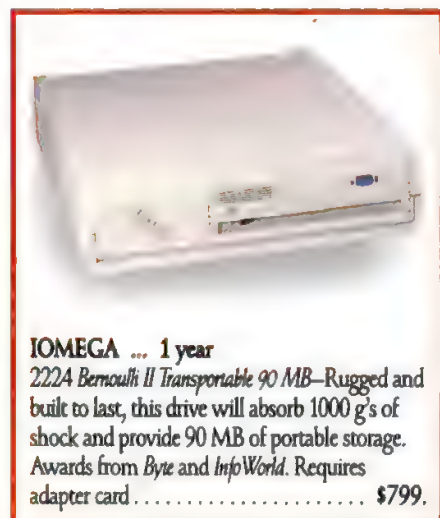
6148	3 1/2" DS/DD (3 Pack)	\$25.
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8185	QD2040 Tape Cartridge	15.
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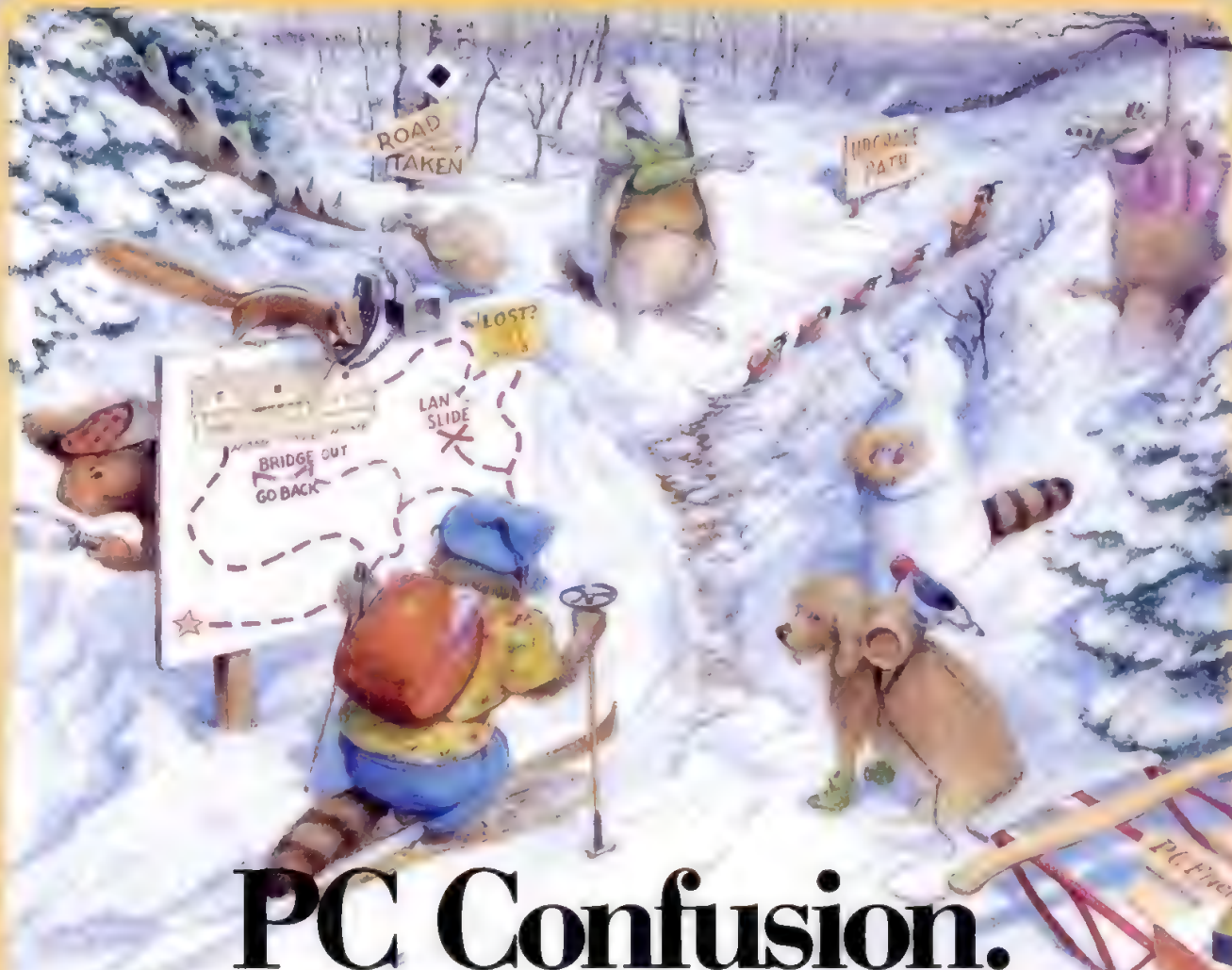
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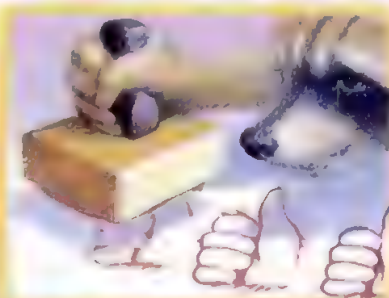
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GRAPHICS TRUE-COLOR BOARDS

(video RAM). This special dual-ported memory can accept data from the video controller while it is sending data to the RAMDAC. This makes for much faster image handling than in dynamic RAM (DRAM), which is less expensive and single-ported.

THE IMPORTANCE OF DRIVERS

There is more to consider than just the hardware when evaluating a 24-bit color board. Getting the card to work properly with your various software—including

Windows—requires a well-written driver. Since there are no standard drivers or BIOS calls for 24-bit color, users must look to the board vendors to provide the necessary drivers for each specific resolution. A good driver can improve video performance and increase compatibility

CALIBRATION AND COMPRESSION FOR 24-BIT COLOR

by James Karney

Seeing isn't necessarily believing with 24-bit color technology. The boards reviewed here provide beautiful displays, but man cannot live by display alone. Save just one of those vividly colored images and there goes a sizable chunk of your storage space; work consistently in 24-bit color at high resolutions and your hard disk will soon be packed tighter than a subway at rush hour.

A 24-bit color screen at 1,024-by-768 resolution requires about 2.3MB of memory—16 times as much as the same image in 16 colors at standard 640-by-480 VGA resolution. A full-page image scanned at 300 dots per inch and 24-bit color depth requires more than 25MB of disk space!

Storage, however, is only part of the file-size problem. Such huge files can take eons to load into a program or save to disk. And moving a 20MB file over a network or sending it to a service bureau can be a real challenge. Fast hard disks, caching controllers, and optical disks can help, but they do not offer adequate solutions. In fact, the only viable solution on the horizon seems to be compression. A 15:1 compression ratio reduces our 2.3MB screen-capture file to 115K. The image will appear on-screen 15 times as fast and take up 93 percent less space on your disk.

THE MAGIC WORD IS JPEG

When it comes to color image compression, the method of choice is JPEG. This standard compression method and file format, developed by (and named for) the Joint Photo-

graphic Experts Group, should soon enjoy the same popularity the Tagged Image File Format (TIFF) and Encapsulated PostScript file format enjoy today. Several software products, such as *ImagePrep*, include proprietary compression methods, but they lack the wide acceptance JPEG offers as a public international standard.

You have several options when choosing and using a JPEG product, all involving trade-offs in cost, speed, and features. The main distinction is between software and hardware solutions;

the latter are generally faster and more expensive. Another variable is the ratio of compression, since there is no set level of reduction for a JPEG file. You can set the ratio based on the capability of the product, the type of image, and the degree of accuracy you desire. The higher the rate of compression, the more information is lost. For example, images compressed at 200:1 tend to lose most of their midtone color detail. For critical applications, the limit is about 10:1 or 15:1.

The hardware approach uses JPEG compression boards with coprocessors to handle the work of shrinking and expanding image data. Opta produces a \$995 compression board that connects directly to its Mona-Lisa display card and decompresses and loads files directly into the adapter's VRAM. The board's performance will vary from one system to another, depending more on the computer's hard disk performance than the speed of its CPU. We found that a 2.3MB screen capture took 4.4 seconds to compress on a 386/25, and 4 seconds to decompress and display. Performing the same test on a 486/25 dropped the times to 4.2 and 3.8 seconds, respectively. (Both machines were equipped with ESDI drives.)

WHEN ROSE IS NOT SO ROSY

The files we viewed under Opta's JPEG program looked redder on our NEC MultiSync 4D monitor than they did when viewed under *Aldus PhotoStyler* or *CorelDRAW*, which brings us to the other major problem with current true-color technology: limited color accuracy.



24-bit boards can display accurate color, but calibration software is usually needed to make scanned images match the original.



with other system components, while a poor or buggy driver can produce strange displays, improper fonts, and even system crashes.

Some boards that have the silicon muscle to run Windows in true-color mode cannot do so for lack of a driver. Since

GRAPHICS TRUE-COLOR BOARDS

most of the applications that can take advantage of 24-bit color run under Windows (3-D rendering being the principal exception), we reviewed only boards equipped with 24-bit Windows drivers.

It is an annoying fact of life with color reproduction: Those brilliant red roses and blue skies you saw on your screen often come back from the printer transformed into dingy browns and sickly greens. Users paying for expensive color printing or presentation slides don't like these kinds of unpleasant surprises. Matching the colors on the monitor with those produced in final output is a real-world challenge faced by anyone doing critical color production on a PC.

So where's the problem? Red is red; blue is blue, right? Alas, no. The systems we use to represent color electronically are only approximations, and many factors can affect the final appearance. Each device used in creating or transmitting an image—scanner, camera, monitor, printer—sees colors slightly differently. In fact, monitors don't display colors quite the same way after they are warmed up as when they are first turned on. Different color printers use different dyes. Even the type of room lighting affects the way a color appears to our eyes. When you send your work to a publisher or service bureau, its equipment adds more variables.

Further complications are introduced by the fact that transmitted color (what we see on a monitor, for example) and printed color (where what we see is the color reflected by the inks or dyes) are created by different color systems. Most monitors create the spectrum using the "additive" primary colors—red, green, and blue (RGB); printers use the complementary "subtractive" primaries—cyan, magenta, and yellow, with black added to enhance the image (hence, CMYK). The International Commission on Illumination (Commission Internationale de l'Eclairage, or CIE) has long been at work setting standards for defining

colors and converting values between the two systems.

WORKING TOWARD WYSIWYG

Today, numerous developers are busy working on practical techniques (and products) aimed at easy correction or "calibration" of digitally processed color. These range from simple and inexpensive to complex and very costly. At the low end, for example, U-Lead *PhotoStyler* is shipped with its own built-in system in which users adjust the appearance of on-screen color patches to predefined values, thus matching the colors on the screen to those the software is sending out. Other vendors supply printed target cards as a reference to be matched by eye.

A more sophisticated and accurate approach, soon to be released by Matrox, uses a probe (essentially a mini color scanner) to measure actual color values both on the monitor and in final output. The monitor is adjusted until the probe gives the same reading on both. Some professional color systems utilize CMYK-based monitors, which may become available for PC use. These are particularly helpful in color prepress work.

There are efforts under way by vendors to develop standards that will match output to the CIE model in a systematic way. Adobe has included color extension in its PostScript Level 2 page-description language. Kodak is working on its own system for electronic photography. Tektronix has printers that can be calibrated for use with Macintosh applications; PC versions are scheduled to follow soon. And so it goes. As true color gains a foothold in real-world color production, solutions will proliferate. For now, just remember: Without some system of color calibration, what you see won't always be what you get. ■

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Just having a driver might not be good enough, however. Unfortunately, the only accurate way to judge the quality of a driver is to test it, preferably by actually running the applications you need to use. If this is not possible, a prudent buyer will spend some time asking the vendor's technical support staff about problems, warranties, and how often the company releases driver upgrades. Not all the products that promise "true-color" drivers fully support 24-bit operation, a lesson we learned during our review process.



EDITORS' CHOICE

■ MonaLisa 24-Bit Color Display Board

Opta's MonaLisa 24-Bit Color Display Board is not the fastest board we tested, but it represents the best value by far. The MonaLisa offers a wide range of high-resolution modes, smooth scrolling, and a good selection of software drivers. And at \$1,995, its cost is well below the average price of all the boards (about \$2,600). A final plus is the availability of a companion JPEG file-compression board. The MonaLisa's only significant weakness is its inability to display more than one full-screen DOS session under Microsoft Windows.

Receiving honorable mentions are two boards that excelled in the one area where the MonaLisa fell somewhat short: sheer speed. Matrox's Impression/AT-S True-Color Graphics Controller and BleuMont's Truc are really fast. At \$2,995 and \$2,495, respectively, they are also expensive.

Both products clearly stood out from the pack on PC Magazine Labs' tests and when performing highly data-intensive operations, such as loading and manipulating complex graphics with gradient fills. The Truc showed particular agility in vector (line) drawing and font handling. Both boards, however, lack integrated VGA circuitry, and their 24-bit drivers cover a limited range of resolutions: 1,024 by 768 and 1,152 by 882 for the Impression/AT-S, and 1,024 by 768 alone for the Truc.

Finding a board with appropriate, robust drivers is only part of the preparation for 24-bit color. Working with true-color images taxes all parts of a PC system; consequently, you'll need to consider a number of other system-level issues. First, 286 and even some older 386 CPUs are simply too slow to run many 24-bit color applications efficiently. Furthermore, you may need to add some memory to your system (and sometimes a lot of memory) to work with these apps. Then again, some 24-bit cards require a monitor with a refresh rate of 70 Hz or higher, so a new monitor may be necessary.

Another point to consider is how a given board handles VGA, which you will need to run your normal software. Does it have its own on-board VGA controller? Is a VGA daughtercard available? Or will you need a separate VGA card and a pass-through cable? The latter two possibilities increase the expense of configuring the computer; the last may require another expansion slot. And unlike VGA, most of these boards will require careful integration to avoid conflicts with network adapters, scanners, and TSRs.

Finally, to play in the true-color league, you really need a hard disk with plenty of capacity. A "simple" 1,024-by-768 24-bit file from a screen capture occupies almost 2MB of hard disk space. Large scanned images and complex graphics at 24-bit color depth can run to more than 100MB per file! Simply loading such large data files into an application will take several minutes under ideal conditions, so hard disk speed is significant as well.

We invited 12 vendors of true-color adapters to send us units for testing. Our requirements: a board with a Windows driver, capable of 24-bit color at any resolution and on-board, daughtercard, or pass-through VGA. Only six boards met these criteria: BleuMont's Truc, the Everex Viewpoint TC, Matrox Electronic Systems' Impression/AT-S True-Color Graphics Controller, Opta's MonaLisa 24-Bit Color Display Board, the RasterOps ColorBoard 1024MC Display Adapter, and the TrueVision 1024-32.

Three boards (from Desktop Computing, National Design Inc., and Number Nine Computer Corp.) do not yet have working 24-bit drivers for Windows. Another board, from Hercules Computer Technology, is supposed to support 24-bit color under Windows but actually ships

Working with true-color images taxes all parts of a PC system, so you'll need to consider a number of system-level issues.

with a 15-bit ("high-color") driver. Boards announced by Artist Graphics and Ventek Corp. are not yet shipping.

In addition to running our traditional performance tests, we used the cards with the kinds of applications for which they were designed: drawing, painting, image-editing, and desktop publishing packages. We loaded several Windows applications simultaneously and watched how the cards performed routine tasks. Some boards were significantly faster at specific tasks, such as redrawing text or handling complex fills. There was little real-world difference among the contenders in performing such routine Windows operations as moving already loaded bitmaps around the screen.

IS 24-BIT COLOR FOR YOU?

Except for highly specialized applications, such as medical imaging and astronomy, 24-bit color takes display technology as far as it may ever need to go. These boards are likely to increase in speed, resolution, and stability as supporting technology improves. And as components get cheaper, 24-bit color boards will become less expensive and more popular. In four years' time, true color may be as commonplace as Super VGA is today.

That is the future. What is today's reality? There are no standards for true-color adapters; therefore, meaningful comparisons of price, features, and performance are difficult to make. Software that makes full use of these adapters is limited to a handful of applications. For professionals whose work involves publishing or graphics, true color offers tremendous potential advantages, and these cards offer real solutions. But given the newness and the expense of this technology, the sensible course for most users is probably to wait and see.

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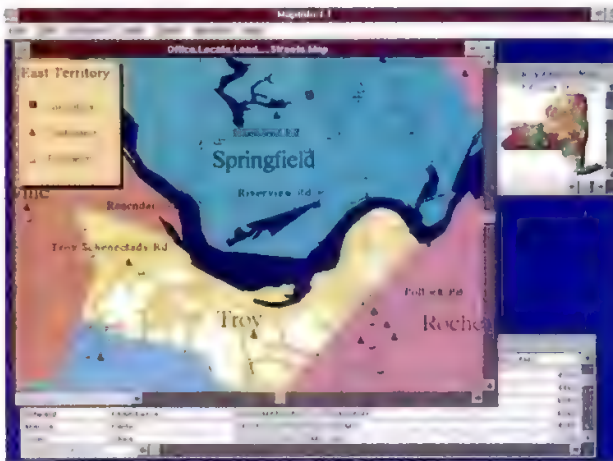
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GRAPHICS TRUE-COLOR BOARDS

24-BIT GRAPHICS ADAPTERS: SUMMARY OF FEATURES

Products listed in alphabetical order by company name

	BleuMont Truc	Everex Viewpoint TC	Matrox Impression/ AT-S True-Color Graphics Controller	Opta MonaLisa 24-Bit Color Display Board	RasterOps ColorBoard 1024MC Display Adapter	TrueVision 1024-32
List price*	\$2,495	\$795	\$2,995	\$1,995	\$3,999	\$3,495
Interfaces available:						
ISA (16-bit)	■	■	■	■	■	■
MCA	□	□	□	□	■	□
PERFORMANCE CHARACTERISTICS						
Graphics coprocessor	8514/A	None	TI 34020	TI 34020	None	TI 34020
Memory						
DRAM (standard/maximum)	N/A	1MB/1MB	1MB/1MB	2MB/4MB	N/A	1MB/16MB
VRAM (standard/maximum)	3MB/3MB	N/A	3MB/3MB	2MB/4MB	3MB/3MB	3MB/3MB
VGA type	Pass-through	On-board	Pass-through	On-board	Pass-through	On-board
On-board VGA BIOS	N/A	Everex 1.01	N/A	Tseng ET 4000 AX	N/A	Tseng/True-Vision 1.4
On-board VGA chip set	N/A	Tseng	N/A	Tseng 512K	N/A	Tseng
VGA memory	N/A	1MB	N/A	512K	N/A	512K
VESA-compliant	N/A	■	N/A	□	N/A	■
Daughterboard options:						
JPEG	□	□	□	■	□	□
VGA	□	N/A	□	N/A	□	N/A
Maximum resolution addressable (pixels)	1,024 x 1,024	1,664 x 1,280	1,152 x 882	1,152 x 900	1,024 x 1,024	1,024 x 768
Maximum resolution displayable (pixels)	1,024 x 768	1,280 x 1,024	1,152 x 882	1,152 x 900	1,024 x 768	1,024 x 768
Maximum columns and rows in text mode	132 x 44	132 x 44	N/A	132 x 44	N/A	132 x 50
COLORS						
Maximum colors at:						
640 x 480 resolution	16.8 million	16.8 million	N/A	16.8 million	N/A	16.8 million
800 x 600 resolution	16.8 million	256	N/A	16.8 million	N/A	16.8 million
1,024 x 768 resolution	16.8 million	256	16.8 million	16.8 million	16.8 million	16.8 million
RAM DAC manufacturer	Brooktree	Brooktree	Brooktree	Brooktree	Brooktree	Brooktree
OUTPUT CHARACTERISTICS						
Maximum vertical refresh rates (in hertz):						
1,024 x 768 (noninterlaced)	70	60	60	72	75	76
1,024 x 768 (interlaced)	N/A	79	N/A	72	N/A	87
SVGA	N/A	72	N/A	72	N/A	60
VGA	N/A	70	N/A	72	N/A	120
Digital/TTL output	□	□	□	□	□	□
Analog output	■	■	■	■	■	■
Connectors	15-pin mini D-sub	15-pin mini D-sub	None	15-pin mini D-sub	None	15-pin mini D-sub
Adapter cable included	□	□	■	□	■	■
SOFTWARE INCLUDED						
Drivers:						
8514/A adapter interface	■	□	□	□	□	□
AutoCAD	□	■	□	■	□	■
Display list driver	N/A	■	N/A	■	N/A	■
Manufacturer	N/A	Everex	N/A	Panacea	N/A	TrueVision
AutoShade/3-D Studio	□	■	□	■	□	■
GEM	□	■	□	□	□	□
OS/2	□	■	□	□	□	□
TIGA	□	□	□	■	□	□
Microsoft Windows 3.0	■	■	■	■	■	■
Other software included	ImagePrep	None	Consistent Color Calibrator	None	ImagePrep	ImagePrep
CUSTOMER SUPPORT						
Hardware warranty	1 year	2 years	1 year	1 year	3 years	1 year
Free technical support	■	■	■	■	■	■
Toll-free number	□	□	■	■	■	□
BBS	□	■	■	■	■	■
Fax	□	□	■	■	□	□

■—Editors' Choice ■—Yes □—No
 N/A—Not applicable: The product does not have this feature.

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BLEUMONT INC.

Truc

by James Karney



BleuMont, a start-up company from Montreal, is off to a very bright start with the Truc, its first product. The board's exceptionally fast performance and particular agility at handling vector drawings and fonts make it an excellent choice for desktop publishing and illustration applications. The Truc's only weaknesses—poor documentation and weak installation support—are typical of a new company.

The Truc (\$2,495) is not only the fastest of the boards we tested for this review, it also has the most unusual design. This board uses three 32-bit Western Digital 8514/A controllers, each equipped with a full megabyte of VRAM. The sole driver provides noninterlaced 24-bit color operation under Windows at 1,024-by-768 resolution, but since there is no other on-board display adapter, users will have to install a separate VGA controller with a VESA-compliant pass-through connector in order to work with software that

GRAPHICS TRUE-COLOR BOARDS

requires VGA or Super VGA resolution.

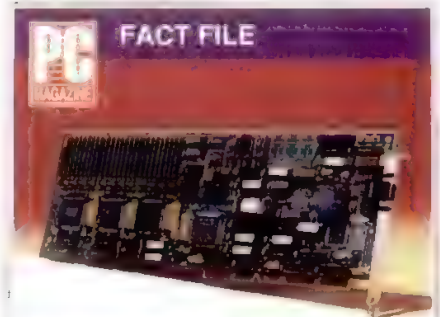
Neither the controllers nor the Brooktree 473 RAM DAC (random access memory digital-to-analog converter) can fully account for the Truc's exceptional speed. The board's design also includes a 96-bit internal bus that can process 4 pixels per memory access, compared with 1 per pass for adapters based on a single Texas Instruments 34020. The result is a 24-bit color display that is at least as fast as a 256-color VGA card operating at the same resolution.

EASY/UNEASY INSTALLATION

The Truc's unusual design gives it other advantages as well. Because of its 8514/A controllers, which are optimized to work with graphical interfaces such as Windows, the Truc can be easier to set up than many of its TI 34020-based competitors. To set up the board on a relatively uncrowded system, you simply install it in a 16-bit slot, connect the monitor to the VGA port, then run the Trucset installation routine. Installing the Truc on a more crowded system (probably a more accu-

rate real-world test) proved far trickier. We had to run the setup program in a command line mode, because the menu-driven Trucset utility failed to operate.

What really complicated the installation, though, was scanty documentation.



Truc

BleuMont Inc., 4900 Jean-Talon West,
#220, Montreal, Quebec, Canada H4P 1W9;
514-340-9992.

List Price: \$2,495.

In Short: BleuMont's Truc is a very fast true-color controller with an innovative design. It is well optimized for publishing and illustration applications, despite documentation and a setup program that could both stand improvement.

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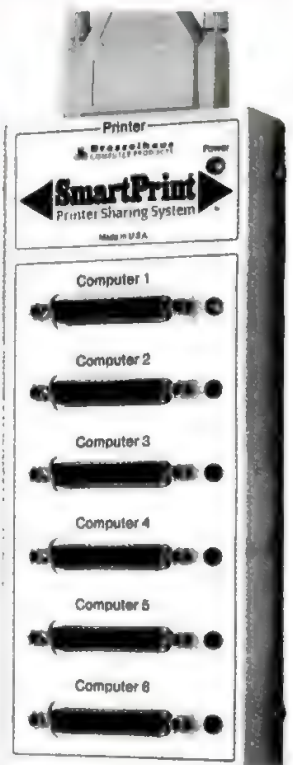
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CRT Dot Pitch	.28 mm	.28 mm	.29 mm	.39 mm

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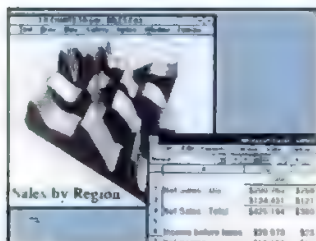
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GRAPHICS TRUE-COLOR BOARDS

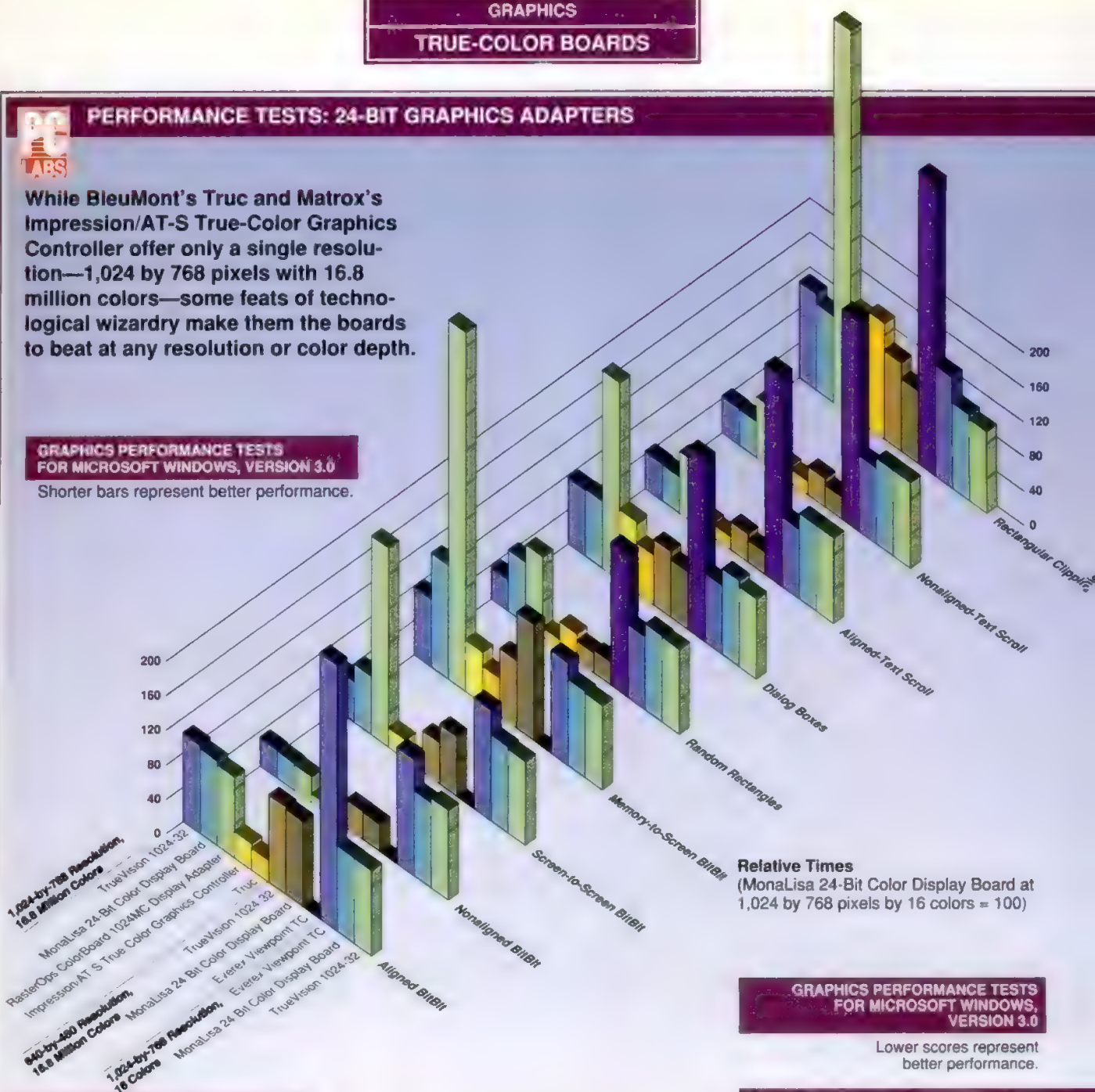


PERFORMANCE TESTS: 24-BIT GRAPHICS ADAPTERS

While BleuMont's Truc and Matrox's Impression/AT-S True-Color Graphics Controller offer only a single resolution—1,024 by 768 pixels with 16.8 million colors—some feats of technological wizardry make them the boards to beat at any resolution or color depth.

GRAPHICS PERFORMANCE TESTS FOR MICROSOFT WINDOWS, VERSION 3.0

Shorter bars represent better performance.



Relative Times

(MonaLisa 24-Bit Color Display Board at 1,024 by 768 pixels by 16 colors = 100)

GRAPHICS PERFORMANCE TESTS FOR MICROSOFT WINDOWS, VERSION 3.0

Lower scores represent better performance.

WHAT THE NUMBERS MEAN

The Truc and the Impression/AT-S clearly outclass the other four boards in this roundup for fast 24-bit editing. The Truc gains its edge through sheer power, in the form of three Western Digital 8514/A chips communicating via a 96-bit internal bus. In contrast, the Impression/AT-S uses the Brooktree BT463 RAM DAC, a chip designed for use in workstations and optimized for windowing environments.

At the other end of the speed spectrum, we find the Everex Viewpoint TC. Normally we refuse to review software still in beta testing, but because Everex ships a beta version of its 24-bit driver to customers, we made an exception. The driver was unable to complete any of the BitBlt tests in 24-bit

mode. On the remaining tests, it proved one of the slowest boards we have looked at recently. Its sluggishness on the Dialog Boxes and Text Scroll tests indicates that it would be a poor choice for everyday Windows use. The RasterOps ColorBoard 1024MC puts on a similarly disappointing show at its only resolution, 1,024 by 768 pixels by 24 bits—an unsurprising result given its lack of a coprocessor.

The middle ground solidly belongs to the similarly configured MonaLisa and TrueVision 1024-32, although the TrueVision 1024-32 performs faster BitBlts. Their disappointing speeds while running in 1,024-by-768 16-color mode stem primarily from the fact that neither board takes advantage of the TI 34020 at this resolution/color combination.

1,024-by-768 Resolution, 16.8 Million Colors

TrueVision 1024-32
MonaLisa 24-Bit Color Display Board
RasterOps ColorBoard 1024MC
Display Adapter
Impression/AT-S True-Color
Graphics Controller
Truc

640-by-480 Resolution, 16.8 Million Colors

TrueVision 1024-32
MonaLisa 24-Bit Color Display Board
Everex Viewpoint TC

1,024-by-768 Resolution, 16 Colors

Everex Viewpoint TC
MonaLisa 24-Bit Color Display Board
TrueVision 1024-32

GRAPHICS

TRUE-COLOR BOARDS

HOW WE TESTED

We tested each ISA board in a Compaq Deskpro 386/25e equipped with 8MB of RAM, a 310MB hard disk, and a 25-MHz Intel 80387 math coprocessor. The RasterOps Colorboard 1024MC Display Adapter was tested in a similarly configured 25-MHz IBM PS/2 Model 70. If a board had its own VGA circuitry, the Compaq's built-in VGA was disabled. For comparison purposes, we are reporting results for both the Compaq and the IBM's built-in VGA (which are standard VGA and do not utilize a graphics coprocessor). All systems were equipped with Compaq or IBM DOS, Version 5.0.

To test the capabilities of the reviewed boards, PC Magazine Labs tested them in

a variety of environments. To reveal the performance differences of the boards when running Windows 3.0, we used Release 1.1 of PC Magazine Labs' Graphics Performance Tests for Microsoft Windows. Each product performed ten iterations of each test, and we report its average time (except when noted). Boards that lacked proprietary VGA drivers were tested using the standard VGA driver supplied with Windows.

To examine VGA performance, we used the PC Labs/Spirit of Performance VGA benchmark tests. Because these tests do not use drivers or other software overhead to exercise the VGA circuitry, they give a true picture of the VGA circuitry's perfor-

mance. For those boards that had only VGA pass-through capability, we did not run VGA performance tests.

We also ran the AutoCAD performance tests for those boards that included an Autodesk Device Interface (ADI) driver; the results were all within approximately 1 second of each other, and therefore did not merit publication.

Although the performance test results run using DOS 5.0 are not identical to the results obtained using DOS 4.01, the casual testing we have done reveals that performance is generally better under DOS 5.0 for both the Windows and VGA performance tests.

■ The **Aligned BitBlt** test draws a 256- by 256-pixel square and uses the Microsoft Windows 3.0 function BitBlt (bit-block transfer) to move it from one on-screen location to another—which is similar to moving a cursor, icon, or window across the screen. Using aligned BitBlts requires little CPU overhead, because it is not necessary to compute the screen-memory offset position. We run the test ten times and report the average timing.

The **Nonaligned BitBlt** test draws a 256- by 256-pixel square and uses the Windows BitBlt function to move it from one on-screen location to another. Using nonaligned BitBlts requires a tremendous amount of CPU overhead, because it is necessary to compute the screen-memory offset position. We run the test ten times and report the average timing.

The **Screen-to-Screen BitBlt** test uses the Windows BitBlt function to move data from one area of screen memory to another. It performs a number of Windows raster operation functions to manipulate bitmaps while performing BitBlt operations. This test measures the efficiency of the Windows driver

as it minimizes the effects of the system bus. We run the test ten times and report the average timing for a BitBlt raster operation.

■ The **Memory-to-Screen BitBlt** test uses the Windows BitBlt function to move data from system memory to screen memory. It performs a number of Windows raster operation functions to manipulate bitmaps while performing BitBlt operations. This test measures the efficiency of the Windows driver as it transfers bitmap data across the system bus. We run the test ten times and report the average timing for a BitBlt raster operation.

■ The **Random Rectangles** test measures the time it takes the graphics adapter and driver to draw a series of random rectangles, which is a common Windows operation, similar to erasing the background of a window or drawing title bars and menus. We run the test ten times and report the average time required to draw a rectangle.

■ The **Dialog Boxes** test generates and erases a Windows dialog box by using the Windows Create-

Dialog and EndDialog functions. Creating dialog boxes is a common Windows function. We run the test ten times and report the average time required to generate and erase a dialog box.

■ The **Aligned-Text Scroll** test scrolls aligned text down an on-screen window. This is similar to scrolling a Windows help screen, word processing file, or spreadsheet. We run the test ten times and report the average time required to scroll one screen of text.

■ The **Nonaligned-Text Scroll** test scrolls non-aligned text down an on-screen window. We run the test ten times and report the average time required to scroll one screen of text.

■ The **Rectangular Clipping** test performs clipping functions on text, lines, and bitmaps. In each case, an application is confined to the boundaries of a window and prevented from drawing outside it by clipping the application to the window area. We run the test ten times for each of the three types of clipping procedures, calculate the three average times, and report the total of the three.

Aligned BitBlt Average Time (milliseconds)	Nonaligned BitBlt Average Time (milliseconds)	Screen-to- Screen BitBlt Average Time (milliseconds)	Memory-to- Screen BitBlt Average Time (milliseconds)	Random Rectangles Average Time (milliseconds)	Dialog Boxes Average Time (milliseconds)	Aligned- Text Scroll Average Time (milliseconds)	Nonaligned- Text Scroll Average Time (milliseconds)	Rectangular Clipping Elapsed Time (milliseconds)
24.92	24.86	51.81	52.19	4.13	366.95	32.74	32.74	3.08
23.95	23.83	73.92	87.85	7.95	372.10	31.74	31.76	2.76
22.86	22.86	250.22	275.72	10.19	1,090.05	53.85	53.62	12.30
7.53	7.75	24.10	39.46	1.05	392.48	13.59	13.89	3.47
6.21	6.34	10.45	29.14	3.42	275.46	11.27	11.45	3.70
24.85	24.57	51.67	51.99	2.54	364.89	25.09	25.04	2.84
24.22	24.20	75.41	89.25	2.97	319.95	19.64	19.60	2.34
N/A	N/A	N/A	N/A	18.44	1,004.54	183.96	184.21	9.38
74.97	102.22	139.24	78.91	9.40	380.83	61.35	66.97	3.56
24.19	74.93	108.16	66.13	11.07	473.88	75.20	75.57	2.76
24.05	78.95	105.61	64.66	10.90	440.55	75.17	75.51	2.61

N/A—Not applicable: The product aborted this test with an Unrecoverable Application Error message

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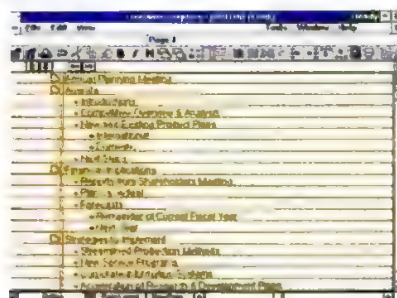
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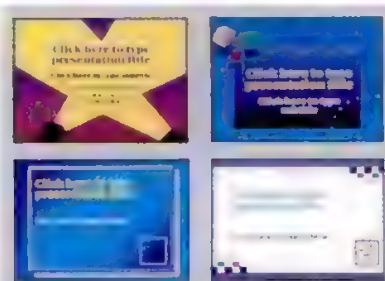
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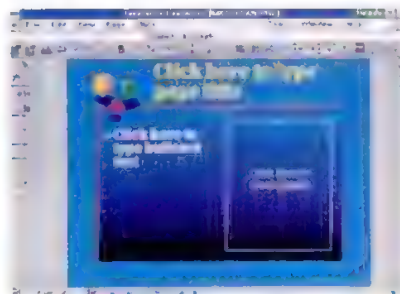
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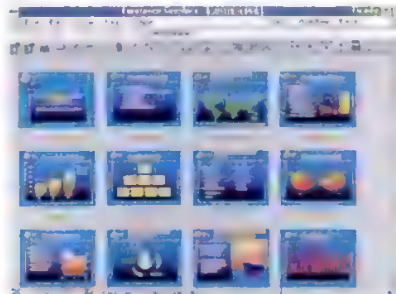
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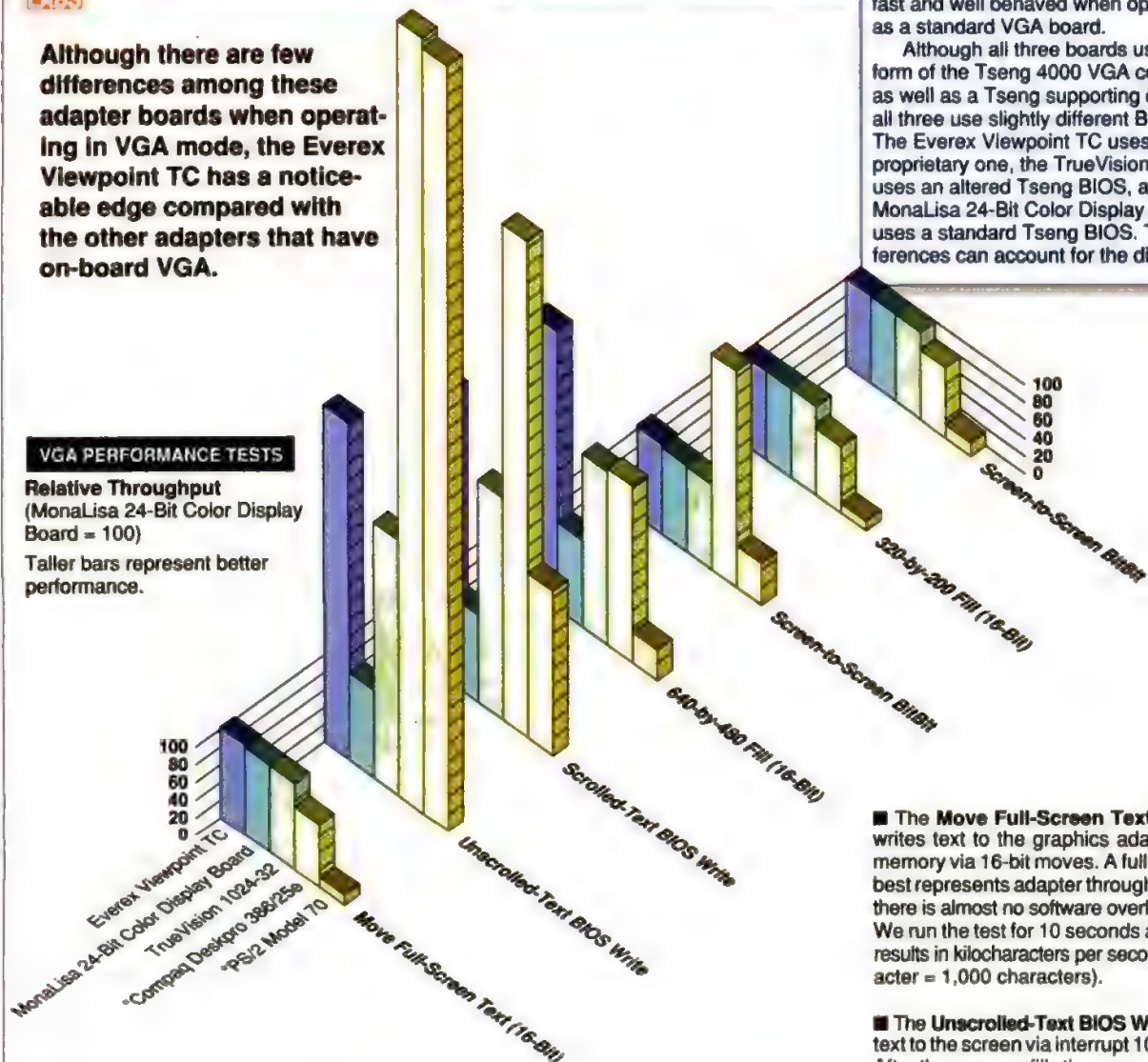
VGA PERFORMANCE TESTS: 24-BIT GRAPHICS ADAPTERS

Although there are few differences among these adapter boards when operating in VGA mode, the Everex Viewpoint TC has a noticeable edge compared with the other adapters that have on-board VGA.

VGA PERFORMANCE TESTS

Relative Throughput
(MonaLisa 24-Bit Color Display Board = 100)

Taller bars represent better performance.



WHAT THE NUMBERS MEAN

While the Everex Viewpoint TC may have its problems under Windows, it is fast and well behaved when operating as a standard VGA board.

Although all three boards use some form of the Tseng 4000 VGA controller as well as a Tseng supporting chip set, all three use slightly different BIOSes. The Everex Viewpoint TC uses a proprietary one, the TrueVision 1024-32 uses an altered Tseng BIOS, and the MonaLisa 24-Bit Color Display Board uses a standard Tseng BIOS. These differences can account for the disparate

■ The **Move Full-Screen Text (16-Bit)** test writes text to the graphics adapter's screen memory via 16-bit moves. A full-screen move best represents adapter throughput, because there is almost no software overhead involved. We run the test for 10 seconds and report the results in kilocharacters per second (1 kilocharacter = 1,000 characters).

■ The **Unscrolled-Text BIOS Write** test writes text to the screen via interrupt 10h BIOS calls. After the program fills the screen with text, the cursor moves back to the top of the screen and repeats the procedure. This test measures the video BIOS's efficiency. We run the test for 10 seconds and report the results in kilocharacters per second.

VGA PERFORMANCE TESTS

Higher scores represent better performance.

	Move Full-Screen Text (16-Bit)	Unscrolled-Text BIOS Write	Scrolled-Text BIOS Write	640-by-480 Fill (16-Bit)	640-by-480 Screen-to-Screen BitBlt	320-by-200 Fill (16-Bit)	320-by-200 Screen-to-Screen BitBlt
	(kilocharacters per second)	(kilocharacters per second)	(kilocharacters per second)	(megapixels per second)	(megapixels per second)	(megapixels per second)	(megapixels per second)
Everex Viewpoint TC	2,443.87	12.34	9.25	42.47	5.04	5.32	1.90
MonaLisa 24-Bit Color Display Board	2,373.77	3.21	2.77	13.37	4.86	5.32	1.88
TrueVision 1024-32	2,368.97	9.40	7.08	26.67	4.80	5.32	1.88
* IBM Compaq Deskpro 386/25e	1,754.74	28.43	15.72	27.17	11.99	4.06	1.49
* PS/2 Model 70	279.65	28.07	5.22	4.70	2.34	0.60	0.29

* Reported for comparison

performance on the Scrolled- and Unscrolled-Text BIOS Write tests and the 640-by-480 Fill test, which are all BIOS-intensive tests.

Because the boards we reviewed all use the same VGA controller and chip set, with similar memory types and configurations, they exhibit markedly similar performance on all of the other tests.

Because all the boards (except the IBM PS/2 Model 70) used a true 16-bit interface, we have not reported their scores on the 8-bit Move Full-Screen Text test. The scores on the 8-bit test were about half the throughput rates achieved on the 16-bit test.

■ The **Scrolled-Text BIOS Write** test writes text to the screen via interrupt 10h BIOS calls. After the program fills the screen with text, each successive text line is teletyped to the bottom of the screen, and a line of text at the top is erased. This test measures forced-scrolling text performance loss and examines the efficiency of the video BIOS. We run the test for 10 seconds and report the results in kilocharacters per second.

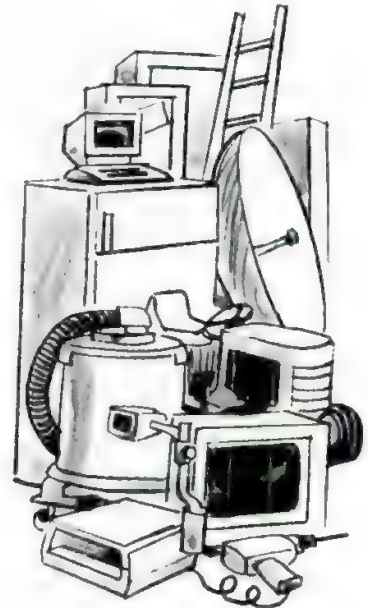
■ The **640-by-480 Fill (16-Bit)** test fills the video memory with color information via VGA write mode 0 (a common write mode used by many software programs). This test measures the graphics adapter's throughput in graphics mode. We run the test for 10 seconds and report the results in megapixels per second (1 megapixel = 1,000,000 pixels).

■ The **640-by-480 Screen-to-Screen BitBit** test divides video display memory into four sections. The first three sections contain different-colored fill patterns. This test measures the graphics adapter's performance when it moves pixels from these three sections to the fourth; it minimizes the effects of the system bus. We run the test for 10 seconds and report the results in megapixels per second.

■ The **320-by-200 Fill (16-Bit)** test fills the video memory with color information utilizing the 256-color VGA mode at 320-by-200 resolution. This test predicts 256-color Super VGA performance. We run the test for 10 seconds and report the results in megapixels per second.

■ The **320-by-200 Screen-to-Screen BitBit** test divides video display memory into four sections. The first three sections contain different-colored fill patterns. This test measures the graphics adapter's performance when moving pixels from these three sections to the fourth; it also predicts the graphics adapter's performance in 256-color Super VGA mode while minimizing the effects of the system bus. We run the test for 10 seconds and report the results in megapixels per second.

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Over the next few months, the Truc should include several accessories that will give it multimedia capability.

The Truc manual devotes eight pages to preparing for installation and inserting the card in the computer, but barely half a page to the setup software. BleuMont expects to correct this problem soon; it is currently working on new versions of both the installation program and the documentation.

Once the card was installed, however, it performed very well. It rapidly loaded complex vector images in *CorelDRAW*, performing about three times as fast as the Everex Viewpoint TC, the MonaLisa 24-Bit Color Display Board, and the RasterOps ColorBoard 1024MC Display Adapter. The cards showed no noticeable speed difference when handling bitmapped images or general Windows operations, but the Truc handled font redraws with exceptional speed.

The Truc was able to manage several open windows and three full-screen DOS applications without any problems. The display exhibited a slight jumpiness when changing from a full-screen DOS environment back to Windows, but it settled very quickly.

Over the next few months, the Truc should include several accessories that will give it multimedia capability. Also in the works is a JPEG compression daughterboard, which will handle digitized video at 30 frames per second with NTSC (television) resolution, and a companion card that can handle sound. A 1,280-by-1,024 version of the Truc is also under development.

BleuMont has done an excellent job engineering this card. The board would certainly benefit from the addition of on-board VGA and a bundled CAD driver, but most users will probably find these omissions acceptable. Considering both price and performance, the Truc looks like a winner.

EVEREX SYSTEMS INC.

Everex Viewpoint TC

by John R. Quain

If you want to compete in the Indy 500, you do not buy a station wagon. By the same token, if you want to render quick 3-D images, you should not buy Everex Systems' Viewpoint TC. If your work is less ambitious, however, this \$795 souped-up ISA VGA board is by far the lowest-priced video adapter capable of 24-bit color on the market.

As you might guess, along with the low price come some drawbacks. In this case, that means you will get a recalcitrant 24-bit Windows 3.0 driver, which Everex was shipping to customers even though it admitted that the software was still undergoing testing and debugging. And you will get only two relatively low resolutions for displaying 24-bit color—640 by 480 and 512 by 480. On the other hand, the Viewpoint TC's 24-bit *AutoCAD* driver makes this board worth considering for CAD work.

There is nothing fancy under the hood here. The full-length, 16-bit Viewpoint TC board features the ubiquitous Tseng Laboratories ET-4000 VGA controller, a Brooktree RAMDAC, 1MB of 70-nano-second DRAM (dynamic RAM) with no memory options, a VESA feature connector, and analog-only output. A set of DIP switches accessible at the back of the card allow you to select 8- or 16-bit bus operation and the monitor type. The adapter does not utilize a graphics coprocessor; instead it employs surface-mounted discrete logic to squeeze the 24-bit color and higher resolutions out of the Tseng/Brooktree combination.

Although the board's 16.8 million colors are available only in 640-by-480 resolution, the Viewpoint TC offers a variety of resolutions for 256- and 16-color display: 256 colors in both 800-by-600 and 1,024-by-768 noninterlaced modes, as well as 16 colors in 1,280-by-1,024 interlaced mode. The board also meets the ergonomic VESA vertical refresh specification of 72 Hz (70 Hz in VGA).

To facilitate software driver installation, Everex includes a basic utility that can automatically insert the necessary commands in your AUTOEXEC.BAT file. The package includes 24-bit VGA-

resolution drivers for both Windows 3.0 and *AutoCAD*, as well as high-resolution 8-bit drivers for OS/2, *Lotus 1-2-3*, *Symphony*, *Ventura Publisher*, and *WordPerfect 5.1*. Everex does not provide 8514/A adapter interface-level compatibility, but third-party software is available for around \$50 (AI, from RIX SoftWorks, for example).

A SLOW PERFORMER

The Tseng-based board passed VGA compatibility and VESA-compliance tests without a hitch. In PC Magazine Labs' VGA performance tests, the Viewpoint TC had the highest throughput of all the boards we reviewed on many of the tests, although it was one of the slowest on the 24-bit tests.

On the Windows 24-bit color tests at 640-by-480 resolution, the board's driver exhibited a few coughs and sputters. In particular, it was unable to complete the BitBlt (bit-block transfers) portion of PC Labs' Windows tests because of unrecoverable application errors (UAEs) encountered with the SOURCECOPY command, which copies a bitmap from one area of screen memory to another.

We did not encounter the problem when using applications, so the problem may not be too serious (Everex said it hoped to have the final kinks worked out by the time you read this review).

The *AutoCAD* tests revealed no problems, and the Viewpoint TC fared at the same level as the other boards in the re-



Everex Viewpoint TC

Everex Systems Inc., 48431 Mimont Dr., Fremont, CA 94538; 800-821-0806, 415-498-1111.

List Price: \$795.

In Short: The Everex Viewpoint TC is a Super VGA video adapter with a limited capacity for 24-bit color; it can deliver true color only in VGA mode. Its performance was overshadowed by the coprocessed big boards, but with 24-bit Microsoft Windows 3.0 and *AutoCAD* drivers included, the price is unbeatable.

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view. These findings are somewhat surprising, since Everex uses a proprietary AutoCAD display list processor (DLP). By the time you read this, Everex should be bundling the board with a true display list driver (DLD) from Panacea.

In general-purpose "kick-the-tires" testing, the BitBlt glitches encountered on the Windows tests caused no real problems. The Viewpoint TC had no trouble maneuvering 24-bit graphics images in *Publisher's Paintbrush*. It also had no difficulty opening several DOS windows and switching among numerous applications running under Windows. It did, however, fail to work with *PageMaker 4.01* in 24-bit mode. To avoid UAEs, you will have to run *PageMaker* in 800-by-600 resolution with only 256 colors.

The board also exhibited some minor glitches when running in 24-bit mode, including Windows icons that seemed to break up while being dragged across the screen. These flaws were not present using any of the Viewpoint TC's other color depths, though.

Everex backs the Viewpoint TC with a two-year parts-and-labor warranty and a BBS service. The company provides free

technical support, although it is a toll call away.

Occasional Windows UAEs and general tardiness aside, the Everex Viewpoint TC is still by far the lowest-cost single-board solution for 24-bit color. It is not the steadiest board, and it won't speed through animated 3-D sequences, but it will ably display 24-bit color photographs. If your needs are simple, the Viewpoint TC could be an attractive choice.

*Occasional Windows
UAEs and general
tardiness aside, the
Viewpoint TC is still
the lowest-cost choice
for 24-bit color.*

MATROX ELECTRONIC
SYSTEMS LTD.

Impression/AT-S True-Color Graphics Controller

by James Karney

Matrox Electronic Systems Ltd., a company that has been making high-end display adapters for the CAD market and custom applications for years, is known for producing quality products at premium prices. The Impression/AT-S True-Color Graphics Controller continues this tradition: The card is a fast and reliable performer. But at \$2,995, it is among the more expensive cards in this review—and one of only two that does not have a CAD driver.

The Impression/AT-S is equipped with a Texas Instruments 34020 processor, 3MB of VRAM, and 1MB of DRAM, but no on-board VGA. The board includes a VGA pass-through cable as well as a special cable with BNC and 15-pin D-sub connectors. The board supports 24-bit color Windows operation at 1,024-by-768

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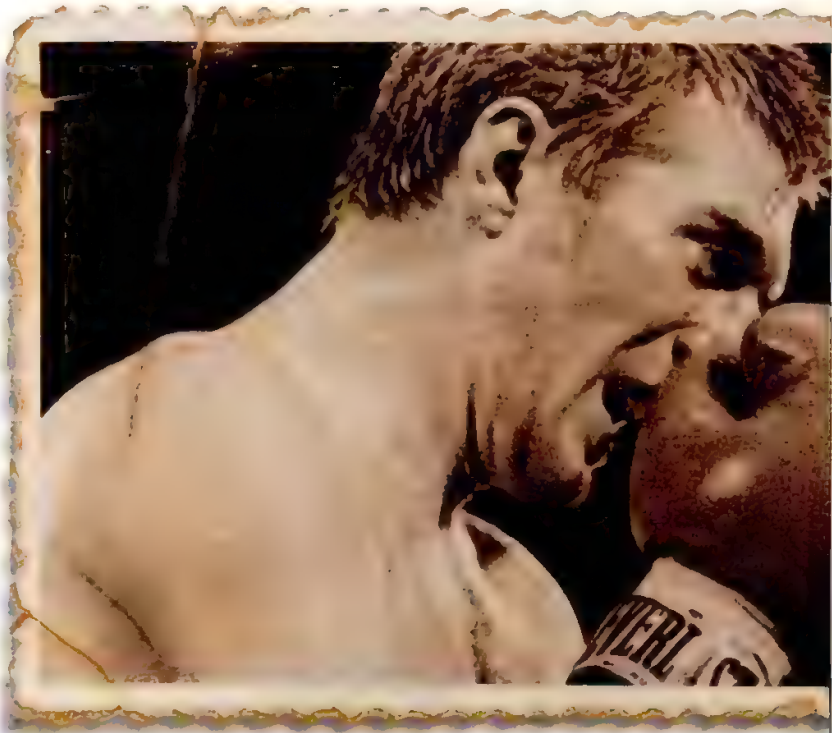
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and 1,182-by-882 resolutions on monitors that have a vertical refresh rate of at least 60 Hz.

Installing the Impression/AT-S is complicated, but a well-designed setup program and clear documentation lead you safely through the process. The setup program offers suggestions for setting the BIOS address, shows you how to set the Impression/AT-S's DIP switches, and then tests the unit for proper operation. Users with few expansion cards should be able to get things running on the first try. In our real-world tests, a crowded 486/33 system required numerous installation attempts before we achieved a compatible configuration, and to make things worse, the setup program locked up the computer every time it found a memory conflict.

TRUE COLOR IN THE FAST LANE

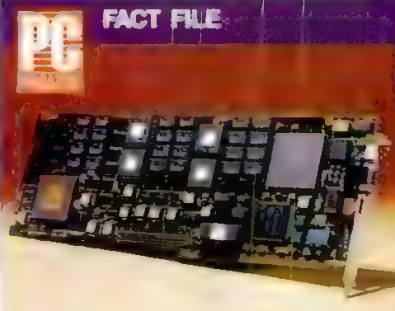
Once everything was properly set up, Windows loaded quickly. The 1,152-by-882 pixel display is particularly impressive, especially when combined with a large-screen monitor that gives you a lot of working area for programs. On an NEC MultiSync 5D monitor, we were able to view two full pages in *PageMaker* and

read 10-point text easily. Visually, the 1,024-by-768 mode is comparable with the other cards in this review, with very fast performance. We used the built-in VGA adapter on a Compaq 386/25e and a Video Seven VRAM II adapter on a 486/33 and experienced no problems switching between adapters.

We loaded several 24-bit raster images in *Publisher's Paintbrush*, opened complex documents in *PageMaker*, and cluttered our desktop with six applications. The Impression/AT-S handled these tasks without a hitch. PC Magazine Labs' tests showed this board to be a pretty close second to BleuMont's Truc. Like the Truc, it loaded complex drawings with a lot of gradient fills very quickly. On routine Windows tasks, such as opening menus and scrolling pages, the Impression/AT-S took about the same amount of time as most of the other cards in this review.

The Impression/AT-S reflects the attention to engineering detail for which Matrox is known. For example, it is the only card we tested that can harness the host CPU to take over part of the workload from the TI

34020 coprocessor when doing so may boost overall performance. In fact, an informal set of tests run on a 486/33 showed some speed gains because of support from the host CPU. The card also incorporates the sophisticated Brooktree BT463 RAM-

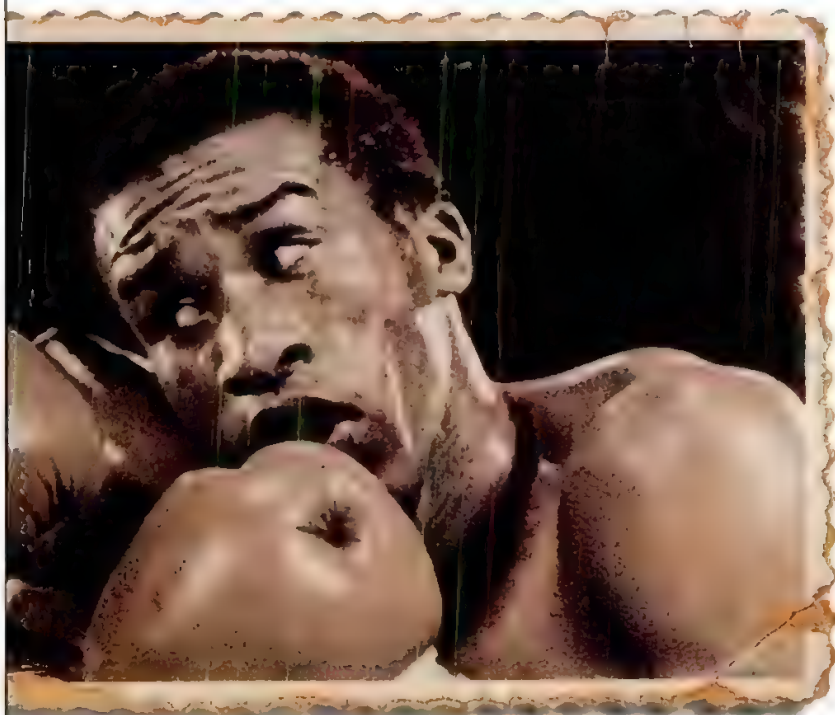


FACT FILE

Impression/AT-S True-Color Graphics Controller
Matrox Electronic Systems Ltd., 1055 St. Regis Blvd., Dorval, Quebec, Canada H9P 2T4; 800-361-4903, 514-685-2630.
List Price: \$2,995.
In Short: The Impression/AT-S True-Color Graphics Controller provides high-speed true color for Windows 3.0 at 1,024-by-768 and 1,152-by-882 resolutions. It offers excellent monitor compatibility but lacks an on-board VGA adapter.

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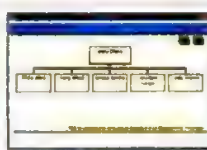
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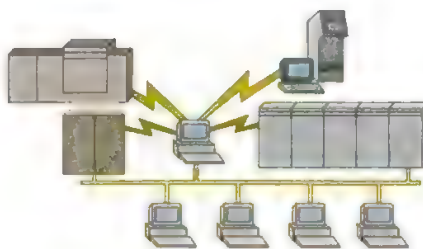
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DAC, which costs about six times as much as the simpler BT473 used in most of the other boards we looked at. The BT463 is designed for graphics workstations and is optimized for Windows-style environments.

The Impression/AT-S should be bundled with a calibration program by the time this review is in print. The beta version of the calibrator we examined lets you manually adjust the monitor's gamma (color balance) control. Matrox is working on an upgrade that will support an optional monochromatic (\$700) or polychromatic (\$3,000) probe, which will let you match your monitor's output to your printer's output and correct variances in ambient lighting conditions. If you work with large images, you will also want to keep an eye out for the JPEG on-the-fly file-compression enhancement that is also under development at Matrox.

The Impression/AT-S True-Color Graphics Controller is a well-designed piece of hardware at a hefty price. It is extremely quick at handling vector drawings and comes with excellent drivers. With the optional calibration tools, it is an excellent choice for anyone interested in high-end publishing, graphics design, or electronic photography. If money is not a limiting factor, it is well worth your consideration.

OPTA

MonaLisa 24-Bit Color Display Board

by James Karney



For solid though not particularly speedy performance at a reasonable price, you need look no further than Opta's MonaLisa 24-Bit Color Display Board. This video adapter—available with either 2MB or 4MB of VRAM at \$1,675 or \$1,995, respectively—combines a wide variety of true-color resolutions and on-board VGA with acceptable speed in a reasonably priced package. It works well for electronic photography and desktop publishing applications.

Both versions of the board sport a Texas Instruments 34020 coprocessor plus an on-board Tseng ET-4000 VGA controller. The 2MB VRAM model, which also has a megabyte of DRAM, is limited to running 24-bit color at a resolution of 640 by 480, or Super VGA at a maximum of 1,024 by

768 pixels with 16 colors. The 4MB version we tested provides noninterlaced and interlaced 24-bit color at up to 1,024-by-768 resolution and will accept up to 4MB of DRAM, which can be used as additional workspace by CAD programs.

Installing the card is not complicated. After you remove or disable any existing video cards, you simply insert the Mona-

Lisa and run the installation program, which provides simple menus for selecting options, and will configure Windows for a true-color driver and install two patched Microsoft files, GDI.EXE and USER.EXE. While installing these patched files is optional, doing so is a good idea; without them, you are liable to experience UAEs, especially when working with large bitmaps. We tried printing from *CorelDRAW* without the patches and got a



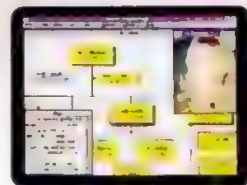
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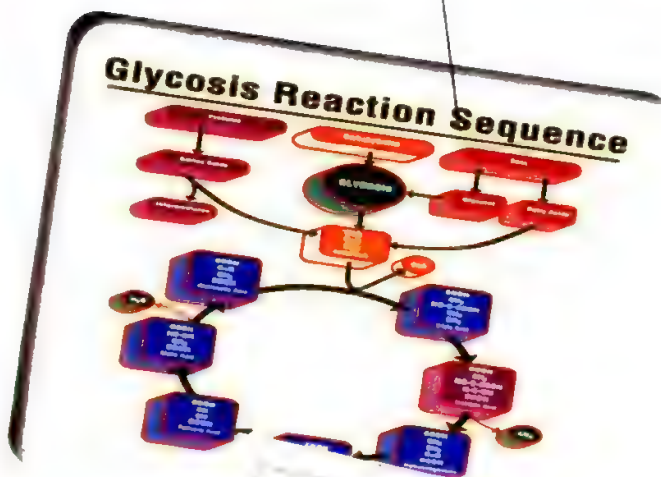
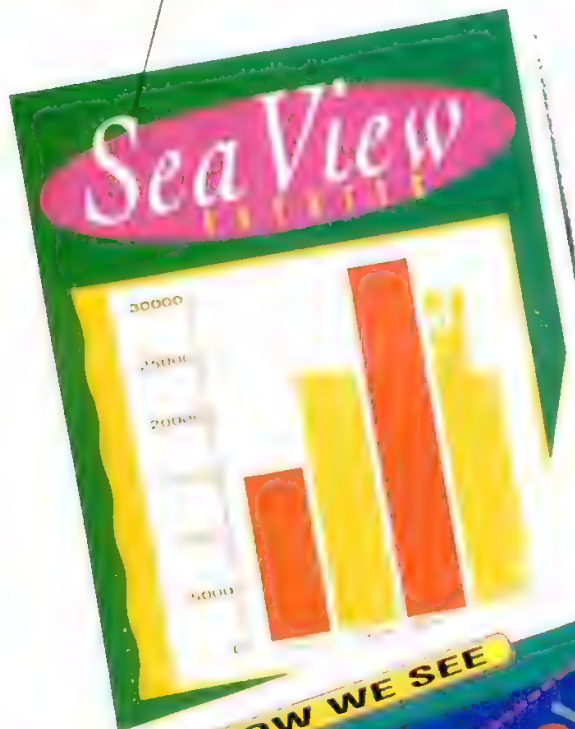
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CIRCLE 477 ON READER SERVICE CARD

UAE that closed the *CorelDRAW* window; with the Opta patches in place, the file printed perfectly.

You may need to do some fine-tuning to configure the adapter to run with your system, though. We found that setting the MonaLisa's memory address to some locations suggested by the installation program prevented Windows from loading. This may have been due to a conflict with the computer's BIOS. On a computer with several expansion cards and TSRs loaded, printing from some applications corrupted the display.

Once we remapped the MonaLisa to a different memory address, all compatibility problems disappeared and the Windows drivers proved very stable. Opta is developing an enhanced setup program that will let you use high-memory areas for the software interface to make configuring the card easier.

FULL RANGE OF DRIVERS

The range of drivers and monitors supported is the best of all the cards we tested. The MonaLisa includes 24-bit color Windows drivers for 640-by-480 and 800-by-600 noninterlaced resolutions, and 1,024-by-768 resolution in both interlaced and noninterlaced modes. VGA options included 640 by 480 and 800 by 600 for both 16 and 256 colors. Opta also includes a Panacea-

GRAPHICS TRUE-COLOR BOARDS

produced Autodesk Device Interface (ADI) driver with six available resolutions for CAD applications.

The MonaLisa's ability to run in so many 24-bit color resolutions on standard VGA monitors sets it apart from its competition, most of which uses pass-through VGA and requires a large-screen, high-frequency monitor. The board is further

distinguished by its ability to run either in an 8- or 16-bit ISA slot or in 8-bit bus mode via software. These options can be a boon to network users who might otherwise encounter compatibility problems. During testing, we operated the MonaLisa at bus speeds up to 16.5 MHz, a real advantage for users with speedier ISA systems that can use the faster bus to improve hard disk operation. This extra speed can be a real plus when you're dealing with

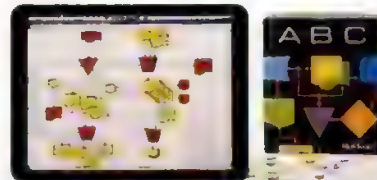
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MonaLisa 24-Bit Color Display Board

Opta, 2525 E. Bayshore Rd., Palo Alto, CA 94303; 800-274-6782, 415-354-1120.

List Price: With 2MB VRAM, \$1,675; with 4MB VRAM, \$1,995.

In Short: The MonaLisa 24-Bit Color Display Board offers an attractive option for users on a tight budget who wish to add true-color capability to their systems, with a very stable Windows driver and on-board VGA controller. Its true-color compatibility with a range of low-cost monitors is the best of any card we tested.

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GRAPHICS TRUE-COLOR BOARDS

To see how the MonaLisa would handle a busy desktop, we opened Word for Windows, Microsoft Excel, CorelDRAW, Aldus PhotoStyler, and Ventura Publisher at the same time.

huge true-color files.

Despite this extra power, however, the MonaLisa turned in unremarkable results on most of PC Magazine Labs' tests. But in operations such as loading bitmapped images or moving them around the screen,

it didn't seem notably slower than the other boards we tested. The one area in which the MonaLisa was clearly slower than BleuMont's Truc and Matrox Electronic Systems' Impression/AT-S True-Color Graphics Controller was in loading and re-drawing complex gradient fills in CorelDRAW. On the other hand, the MonaLisa's VGA modes were faster than those of our Compaq test-bed's own on-board controller—which was very fast—and they worked flawlessly.

A REAL WORKOUT

To see how the MonaLisa would handle a busy desktop, we opened Word for Windows, Microsoft Excel, CorelDRAW, Aldus PhotoStyler, and Ventura Publisher at the same time. To the video board's credit, Windows operated normally, without any degeneration in the quality of the display. Fonts were clean and easy to read, and switching among the various resolutions and color depths using Windows Setup worked perfectly.

We did find one real shortcoming when running Windows in 24-bit color mode:

Due to the difficulty the MonaLisa has switching to and from the on-board VGA controller, you can only run one DOS application at a time in a full-screen window. You can have other DOS applications open simultaneously, however, if they are minimized.

In addition to the MonaLisa board, Opta offers an optional JPEG compression board that can condense or expand a 912K file in about 2 seconds. This board's software supports manipulation of .BMP, .JPG (JPEG), .DIB (Windows Device Independent Bitmap), and RLE (Run Length Encoded) formats. A spokesperson for the company says that Opta is currently working on a TIFF filter as well. The compression program also lets you reset the board's I/O address and it will perform automatic diagnostic tests each time that you use the board.

The MonaLisa is a well-engineered board priced well below most of its competition. Its variety of drivers, its optional compression tools, and the ability to work in 24-bit color mode with standard VGA monitors make it a good value. While not the fastest board available, it is a good performer at a reasonable price.

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RASTEROPS

RasterOps ColorBoard 1024MC Display Adapter

by John R. Quain



Already familiar to Apple, SPARC, and MCA users for its monitors and video products, RasterOps is courting the high-end video market with the RasterOps ColorBoard 1024MC Display Adapter. This board is not only the sole video adapter in our roundup that conforms to IBM's Micro Channel architecture (MCA), it is also the most expensive adapter (\$3,999). That may not be surprising given the narrow selection of MCA video cards on the market, but the 1024MC's limited abilities and unspectacular performance will make even PS/2 owners wonder whether riding this one-trick pony will bruise more than their budgets.

The 1024MC's lack of an Autodesk Device Interface (ADI) driver restricts it primarily to desktop publishing and image-editing chores, and it can display only one resolution, 1,024 by 768 pixels, in 24-bit color.

The 16-bit, full-length 1024MC with pass-through VGA has a relatively straightforward design compared with its competitors. It employs a Brooktree RAMDAC, has 3MB of 100-nanosecond dual-ported VRAM (there are no memory upgrade options), and performs standard frame buffering as well as hardware BitBlts (bit-block transfers). RasterOps provides only two drivers for the 1024MC: Windows 3.0 and OS/2 Presentation Manager.

Eschewing the use of a standard graphics coprocessor, the RasterOps ColorBoard utilizes proprietary programmable array logic (PAL) and VLSI chips to control board functions. Even though the 1024MC is an MCA adapter, it provides only a 16-bit interface with the Micro Channel's 32-bit bus; thus, owners of an IBM PS/2 Model 90 or 95 won't be able to take advantage of the machine's 32-bit expansion slot with the 1024MC.

The 1024MC includes a monitor ID plug, a short 15-pin-mini-to-15-pin-standard converter cable, and a 15-pin-standard-plug-to-BNC cable for easy hookup. The board's analog-only output is conveyed via a standard 15-pin connector.

The software installation simply involves changing the IBM system setup and entering Windows Setup to load the RasterOps driver.

CLARITY BUT NOT SPEED

Operating at a 75-Hz vertical refresh rate in 1,024-by-768 mode with 16.8 million colors, the 1024MC produced crisp, clear images. In the Aligned and Nonaligned BitBlts sections of PC Magazine Labs' Windows tests, the 1024MC was slightly quicker than the MonaLisa and the TrueVision 1024-32, but far behind the speed offered by the Impression/AT-S and Truc adapters. The board dropped from average to poor on our other tests, however. When performing screen-to-screen and memory-to-screen BitBlts, the 1024MC dropped into last place, pointing to a significant shortfall of the RasterOps driver when moving raster images around the system under Windows.

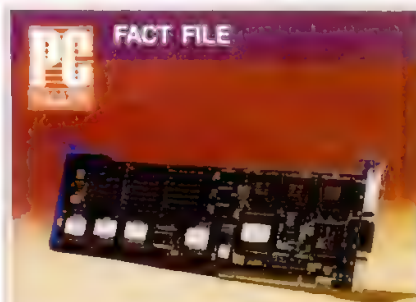
On the positive side, running Windows 3.0 applications, such as *PageMaker*, produced none of the dreaded unrecoverable application errors (UAEs) that can haunt intensive desktop publishing work. And

though the price of the 1024MC may exhaust your budget, buying a matching monitor need not. The 1024MC allows you to overlay a VGA window onto a 1,024-by-768-pixel image, so you don't need to resort to a two-monitor setup. And by changing a jumper setting on the board, you can choose the flicker-free 75-Hz vertical refresh rate or a lower 60-Hz rate to

Already familiar to
Apple, SPARC and
MCA users for
monitors and video
products, RasterOps is
now courting the high-
end video market.

accommodate less expensive monitors.

The 1024MC is covered by a three-year parts-and-labor warranty, toll-free technical support, and a BBS for users. Along with the board, RasterOps includes a copy of *ImagePrep* and a rather lightweight user manual (admittedly, there aren't a lot of features to cover). If you are tied to an MCA machine and need Windows support, the 1024MC may be your only 24-bit color choice at the moment. But RasterOps should not be satisfied with being the only choice—with the advent of less expensive graphics accelerator chips and continuing price wars, it is doubtful that a niche product like the 1024MC will be able to justify its nearly \$4,000 price tag for long, even in the MCA environment.



FACT FILE

RasterOps ColorBoard 1024MC Display Adapter
RasterOps, 2500 Walsh Ave., Santa Clara, CA 95051; 800-729-2656, 408-562-4200.

List Price: \$3,999.

In Short: The only MCA 24-bit color video adapter we tested, the RasterOps ColorBoard 1024MC Display Adapter is also the most expensive. For the price, you might expect lightning speed and a variety of features, but the 1024MC delivers neither. It offers average performance, 1,024-by-768 resolution only, and just two drivers—for Windows 3.0 and OS/2.

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TRUEVISION INC.

TrueVision 1024-32

by John R. Quain



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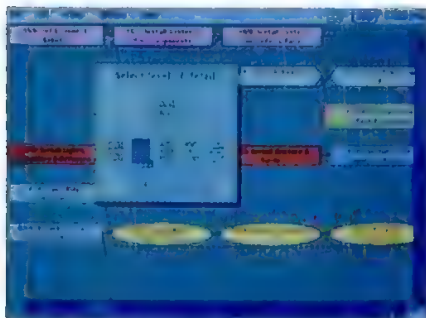
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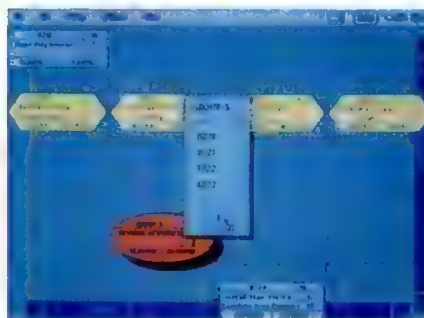
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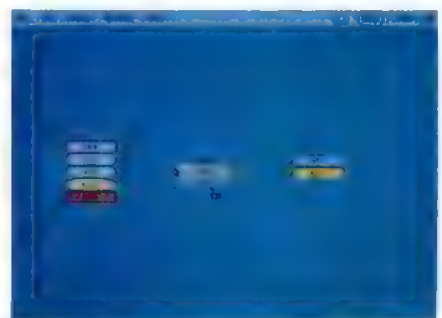
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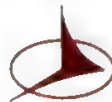
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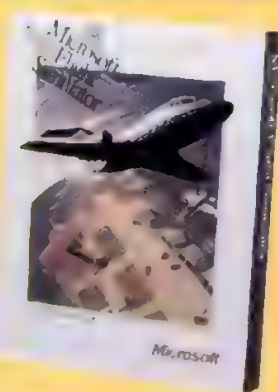
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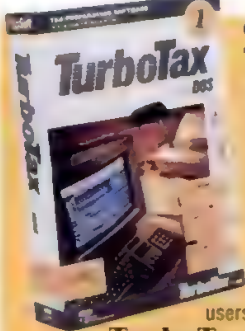
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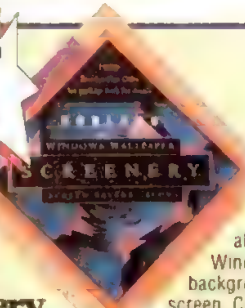
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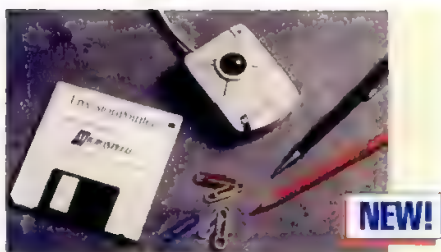
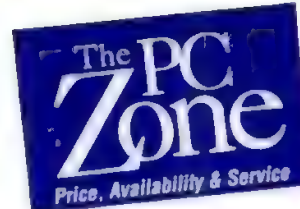
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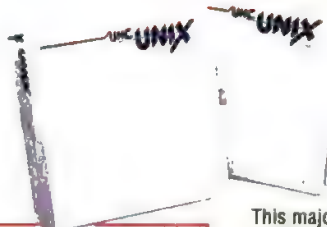
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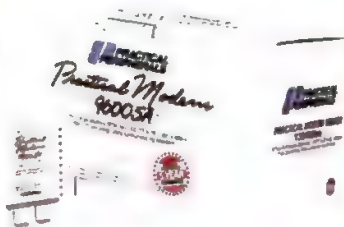
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talizing on its extensive color experience with the TrueVision 1024-32, a 24-bit video adapter with enough speed and flexibility to work in both DTP and CAD environments. The 1024-32 can handle both Windows 3.0 and AutoCAD in resolutions up to 1,024 by 768, and it offers convenient features such as hardware pan and zoom to perform pixel-level surgery in any application.

In its standard configuration (\$3,495), the full-length, 16-bit ISA 1024-32 comes with 3MB of VRAM and 1.5MB of 100-nanosecond DRAM (of which 512K is VGA memory). TrueVision offers two memory upgrade cards: 4MB of DRAM (\$1,000) and 16MB of DRAM (\$4,000). The card's design is divided into two sections: an on-board VGA portion controlled by Tseng Laboratories' ET-4000 chip with a 256-color Sierra RAMDAC and an "accelerated" 24-bit color portion running under Texas Instruments' latest programmable graphics coprocessor, the TMS 34020, with a Brooktree RAMDAC. The board's internal 32-bit video path includes an Alpha channel for future use of the high 8-bit path.

The accelerated portion of the 1024-32 delivers 16.8 million colors in NTSC or PAL at 640-by-480, 800-by-600, and 1,024-by-768 resolutions. It is capable of 60-Hz, 72-Hz, and 76-Hz vertical refresh rates in 1,024-by-768 mode, but only 60 Hz in SVGA—a restriction of the software drivers, not the board. TrueVision also provides drivers for interlaced 1,024-by-768 operation to accommodate users with less robust monitors, such as the popular NEC MultiSync 3D.

In addition to the 24-bit color Autodesk Device Interface and Windows 3.0 drivers, the 1024-32 includes 256-color drivers for its Tseng-controlled portion. Tseng driver support includes popular packages such as Lotus 1-2-3, Ventura Publisher, and WordPerfect, Versions 5.0 and 5.1. The TrueVision board is not 8514/A-compatible, but there is a Tseng 8514/A emulation driver.

Installing TrueVision's Windows driver is a simple process. You click on the 1024-32's install file and dialog boxes appear, enabling you to select monitor settings, 24-bit color resolutions, VGA resolutions, synchronization, and video mode easily. Additionally, you can also set jumpers on the board to disable the Tseng VGA portion, select 8-bit operation, or, using rotary switches, change the I/O address.

The 1024-32 has a nifty hardware pan-and-zoom feature that provides zooms in a fraction of the time it takes applications using software only.

EVERYTHING'S UNDER CONTROL

For PC Magazine Labs' tests, we outfitted the 1024-32 with the 4MB memory option (for a total of 8MB and \$4,495) and ran it at its maximum vertical refresh in each mode. The accelerated portion of the board assumes control for 24-bit color operation, while the Tseng controller and 512K of the board's memory handle VGA and Super VGA operations. Consequently, the 16-

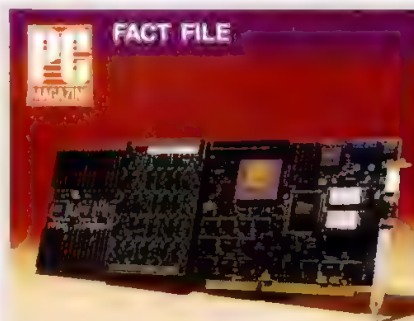
color VGA Windows tests yielded results comparable to standard SVGA adapter performance.

For the Windows tests in 24-bit color mode at 640-by-480 resolution, where the TMS 34020 portion of the board takes control, the 1024-32 managed to maintain its times, suffering no significant decrease in speed and actually bettering the Tseng's 16-color performance in some areas. As we moved the Windows resolution requirements up to the demanding 1,024-by-768-pixel level with 16.8 million colors, the 1024-32's performance was still quite respectable. It proved slightly slower than the similarly skilled MonaLisa adapter on nearly half of the tests, although both the 1024-32 and the MonaLisa were substantially behind the stellar performance offered by the Impression/AT-S and Truc adapters.

AutoCAD performance tests among the boards tested were all very close at 640-by-480 resolution; differences only became distinguishable at 1,024-by-768 resolution, where the MonaLisa surpassed the 1024-32. It is important to remember, however, that the TrueVision video board utilizes only 512K with the slower Tseng controller at the tested 16-color level.

In everyday operation with PageMaker and Publisher's Paintbrush, the 1024-32 managed smooth moves and redraws. It was able to handle multiple .PCX files in Windows with concurrent DOS applications. The 1024-32 has a nifty hardware pan-and-zoom feature that, by storing an oversize virtual screen image in memory, provides zooms in a fraction of the time it takes applications using software only.

To top off the package, TrueVision bundles the 1024-32 with a copy of Image-Prep and a 15-pin-to-9-pin monitor cable. TrueVision offers a one-year parts-and-labor warranty, as well as both a toll-free technical support line and a BBS. For about \$950, users can also obtain TrueVision's VIDI/O Box to convert the 1024-32's output to a composite NTSC video signal and put the alpha channel to use. All in all, what the 1024-32 may lack in sheer speed it more than makes up for in ease of use and flexibility. ■



TrueVision 1024-32

TrueVision Inc., 7340 Shadeland Station, Indianapolis, IN 46256-3925; 317-841-0332.
List Price: With 4MB VRAM, \$3,495. 4MB DRAM upgrade, \$1,000; 16MB DRAM upgrade, \$4,000.

In Short: One of the most flexible boards in this roundup, the TrueVision 1024-32 boasts on-board VGA, the TI TMS 34020 coprocessor, and 16.8 million colors at 1,024-by-768 resolution. Flat-out speed is not this board's hallmark, but its variety of abilities and convenient features should draw accolades from DTP and CAD users alike.

CIRCLE 401 ON READER SERVICE CARD

Gayle C. Ehrenman is a staff editor at PC Magazine. James Karney is a computer and information systems consultant in Clinton, Tennessee, and the author of books on CorelDRAW and related topics. John R. Quain is a frequent contributor to PC Magazine.

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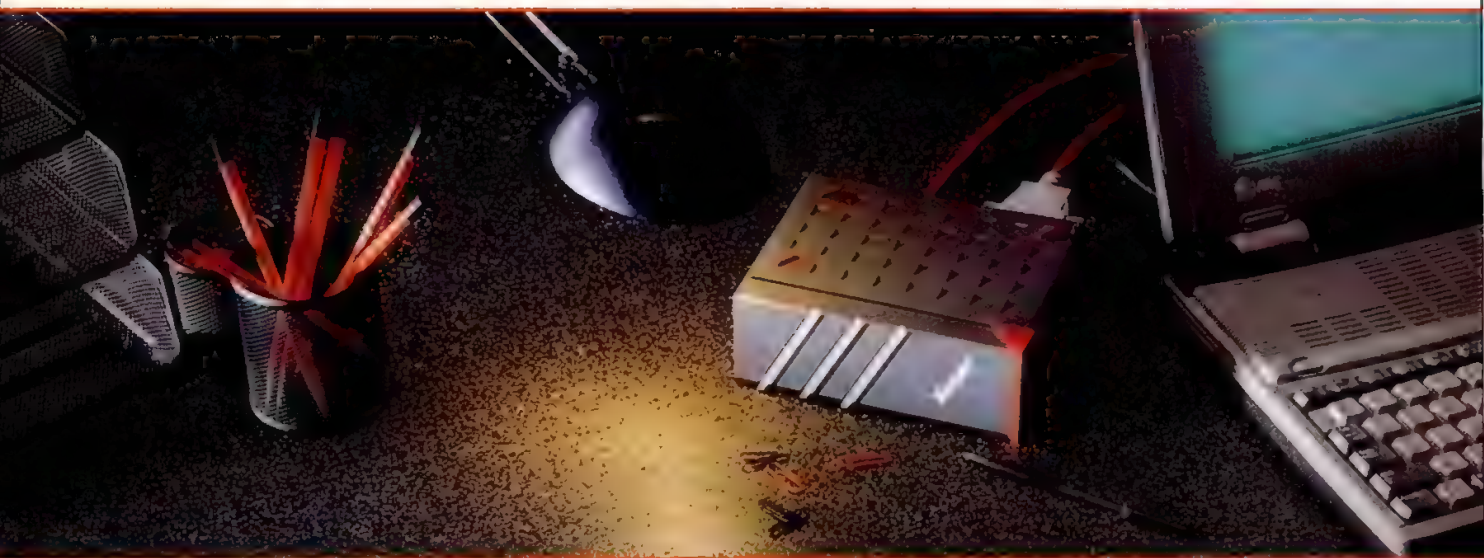
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SPC SOFTWARE PUBLISHING

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CIRCLE 211 ON READER SERVICE CARD

EXTERNAL TOKEN-RING ADAPTERS

Plug and Play—and Pay?

by Frank J. Derfler, Jr.

Portable LAN adapters provide convenient network attachments for laptop users through the parallel port or expansion bus. They are so easy to install that one in six is used with a desktop PC.

But they run slower than LAN cards and cost a bit more.

When external LAN adapters first entered the market in 1989, everyone assumed that the adapters would find homes on desktops where slotless laptop and notebook PCs did the computing chores. No one foresaw how useful the plug-and-play connectors would be to the much larger networked desktop PC community. But within a year, savvy LAN managers realized that the value of these adapters extended much further. The easy installation of the tiny 1- and 2-pound adapters made them ideal tools for LAN testing and troubleshooting, and a surprising number

were being attached to desktop PCs; Xircom, for instance, says that 15 percent of its external adapters are used with desktop machines. The adapters' limited throughput capabilities are not an issue in diagnostic applications, and many users find their throughput speed sufficient for office applications.

This review examines the newest category of external LAN adapters: those designed for 4- and 16-megabit-per-second (Mbps) Token-Ring connections. The five products in this review include the RingPocket 4/16 from Accton Technology Corp., the p.LAN 16/4 Token-Ring Adapter from IQ Technologies, the Megahertz External Token Ring Adapter from Megahertz Corp., and two adapters from Xircom: the tiny Xircom Pocket Token Ring Adapter and the larger Xircom External Token Ring Adapter.

The five adapters can be divided into three categories:

- The kind of adapter that attaches to a portable's external bus connector (the Megahertz adapter).
- Parallel-port adapters that share their connection with other devices (the p.LAN and Xircom's External adapter).
- Parallel-port devices that monopolize the port (the RingPocket and Xircom's Pocket adapter).

With retail prices ranging from \$800 to \$1,000, these products are priced similarly to internal 4Mb/16Mb Token-Ring adapter boards. The external adapters must include separate power supplies and housings, as well as the electronic components found in internal adapters. Certainly these extras provide external adapters with everything you need to make a nearly instantaneous network connection easily.

All you have to do to serve up a LAN connection with an external LAN adapter is plug it into the PC's parallel printer port or its expansion bus and load the adapter's driver software. The process is that simple. And while our tests show that these adapters communicate less quickly than bus-based adapters, the tests clearly repudiate the rumors that external adapters will slow down an entire Token-Ring network.

FASTER TRANSFERS COMING

In addition, by the time you read this, the speed gap between external and internal adapters will have closed considerably, thanks to the now-available high-speed parallel ports. Designed by Xircom and included in Intel's new 25-MHz 80386SL

by Joe Salemi

External adapters are an excellent choice for connecting a laptop or notebook system to a LAN for heavy or extended use. But they can be overkill when all that is needed is an occasional connection for transferring files, checking e-mail, or running a quick print job.

A common solution to this problem has been choosing one of the laptop-to-PC products, such as *The Brooklyn Bridge* or *LapLink*. Unfortunately, these products add a layer of complexity to the connections; the remote PC can access only the local or mapped drives actively connected to the host or server PC.

East Coast Software's \$149 *Lap2Lan* takes a different approach: It uses the Novell IPX protocol to bypass the host PC and talk directly to its network interface card. Once all the connections are made, the remote PC acts as a completely separate node; it has independent access to the LAN and does not tie up the host.

Like the traditional products, *Lap2Lan* connects the host and laptop PCs with a supplied parallel-port cable (a serial-port cable is optional). But this is where the similarity ends. After the cable is plugged into both systems, the host PC is booted and the IPX driver loaded. The *Lap2Lan* driver is then loaded on the host (the same L2L.COM program works on both the host and remote computer), and the appropriate NETx program is loaded. The user then loads L2L.COM and NETx on the laptop, and subsequently can log on to the LAN and use it normally, with no further involvement of the host PC. This architecture makes *Lap2Lan* completely independent of the network topology; the program can be used on ARCnet, Ethernet, or Token-Ring LANs with equal ease.

The software driver takes approximately 33K of RAM on the host system and 14K on the laptop. One welcome touch is a command line option

that has the program stop and ask the user whether the driver should be loaded. If the user decides not to load the driver, the program returns a DOS error-level number that can be used in a batch file to branch around a call to load NETx. This means that you can easily call the drivers from AUTOEXEC.BAT, and not have them taking up RAM if they are not needed.

As might be expected, we found that *Lap2Lan*'s performance is considerably slower than that of the internal Token-Ring adapters (we tested them under the same conditions as the external adapters). When the host PC was idle, *Lap2Lan* returned a throughput of approximately 200 kilobits per second (Kbps), about half that of the external adapters. But when the host PC was in use, *Lap2Lan*'s throughput dropped to a sluggish 70 Kbps as both machines contended for the services of the same adapter and cable.

The version we tested is for *NetWare* LANs. Support for other networks, such as *LAN Manager*, *LANtastic*, and *VINES*, is under development at the time of this writing.

Lap2Lan's performance makes its use as a full-time network connection questionable. But its low cost and easy setup make it ideal for those who have only an occasional or light-duty need to access their LANs. Its topology-independence makes it an excellent choice for situations where connections must be made to many different LANs. ■

Lap2Lan, Version 1.10

East Coast Software Ltd., 2300 Peachford Rd., #1150, Atlanta, GA 30338; 800-829-8713, 404-455-8773. List Price: \$149.

Requires: Laptop: 128K RAM, parallel or serial port, DOS 3.1 or later. Server: *NetWare* 2.0a or later.

In Short: *Lap2Lan* is an excellent low-cost way to provide occasional or light-duty access to a LAN from a laptop or notebook system, regardless of the network topology.

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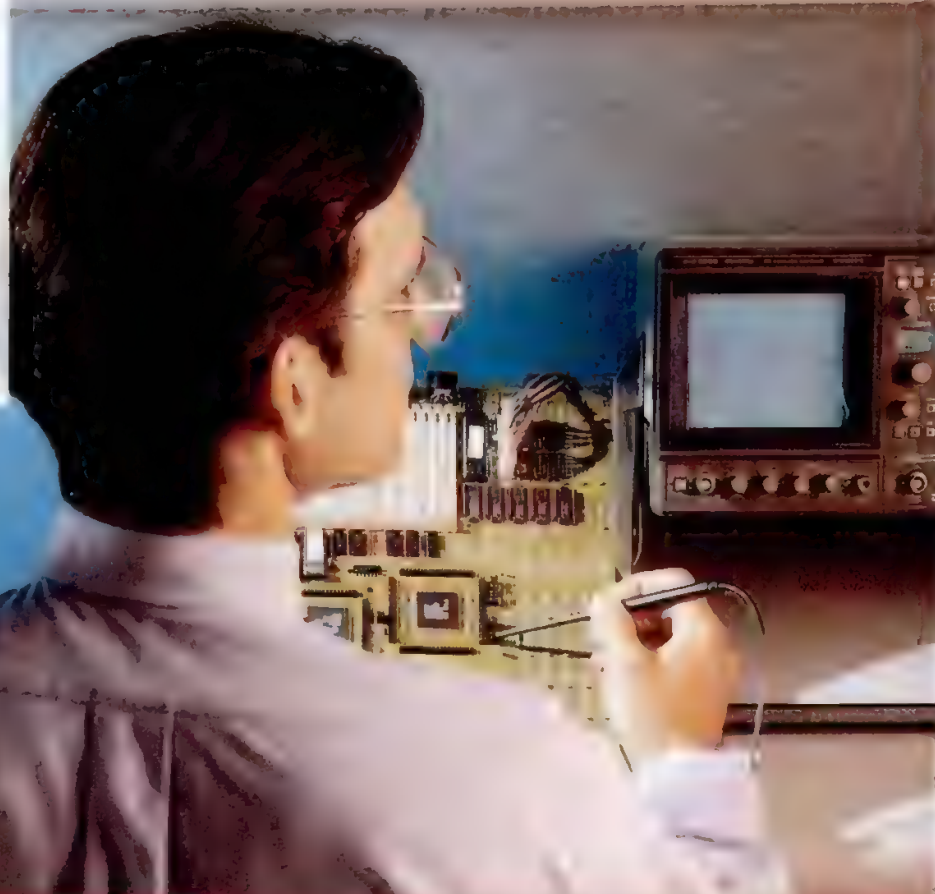
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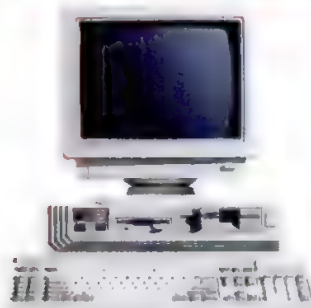
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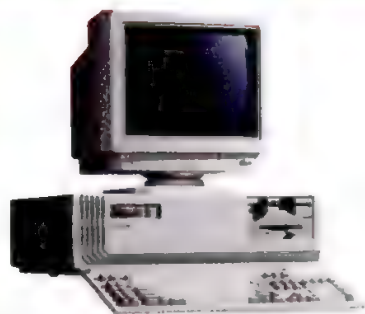
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OTHER LINKS TO THE LAN

Ethernet adapters,
ARCnet adapters, file-
transfer software:

Here's how to connect.

by Frank J. Derfler, Jr.

While organizations are installing new Token-Ring networks at a slightly faster pace than Ethernet networks, there are many more installed Ethernet and ARCnet nodes than Token-Ring nodes.

In case you need to connect a laptop or any PC to an Ethernet or ARCnet system, all of the companies marketing external Token-Ring adapters also make external Ethernet adapters (see the table "The Wide Variety of External LAN Adapters"). If you want to connect to unshielded twisted-pair wiring installed under the Ethernet 10BaseT standard, Xircom offers external adapters with both RJ-45 twisted-pair and BNC coaxial connections.

The retail prices for external Ethernet adapters cluster around \$595. Direct-mail vendors offer such products for about \$375—still \$200 to \$300 more than street prices of top-quality internal adapters. CNet Technology and Xircom market similar products for ARCnet with retail prices not much higher than \$300, as do D-Link Systems, IQ Technologies, and Solectek Corp. The Ethernet adapters are typically compatible with LANtastic, VINES, and a variety of other LAN operating systems.

Note that in terms of the internal configurations and parallel-port drivers, the Token-Ring adapters in this review are very different from their Ethernet and ARCnet cousins. The specific technical and performance information on Token-Ring products does not carry over.

THE WIDE VARIETY OF EXTERNAL LAN ADAPTERS

Most adapter companies offer a variety of products for different network configurations.

NETWORK PROTOCOL	TOKEN-RING		ETHERNET						ARCNET
	4Mb	4Mb/16Mb	10BaseT	BNC	AUI	Thick-to-thin	10BaseT/BNC	10BaseT/thick-to-thin	
Accton Technology Corp.	☐	☒	☒	☒	☒	☒	☒	☒	☒
CNet Technology Inc.	☐	☒	☒	☒	☒	☒	☒	☒	☒
Dayna Communications*	☒	☒	☒	☒	☒	☒	☒	☒	☒
D-Link Systems Inc.	☐	☒	☒	☒	☒	☒	☒	☒	☒
IQ Technologies Inc.	☒	☒	☒	☒	☒	☒	☒	☒	☒
Megahertz Corp.	☐	☒	☒	☒	☒	☒	☒	☒	☒
Solectek Corp.	☒	Pending**	☒	☒	☒	☒	☒	☒	☒
Xircom Inc.	☒	☒	☒	☒	☒	☒	☒	☒	☒

☒—Yes ☐—No

* Dayna, which markets Macintosh products, also sells a fiber optic adapter.

** Solectek plans to market this type of external adapter by the time this issue goes to press.

MAYBE YOU DON'T NEED THEM

While external adapters are an important part of every network environment, you might not need them. In some cases, low-cost file-transfer programs can give you the ability to move files, share drives, and access network resources without buying another LAN adapter for your laptop. (See the sidebar "NetWare Connections on the Fly.")

If you use a laptop computer in conjunction with a PC that is already on a network, you might not need a network adapter to benefit from the network's resources. If you use a file-transfer program of any kind, you can typically use the PC's internal and networked drives to transfer files through the program's menu (as discussed in "File-Transfer Software," March 12, 1991). If the file-transfer program provides the capability to use virtual drives, you can access the PC's networked drives and resources such as a printer as if you had a direct network connection. (Virtual drive use is available from software packages such as *The Brooklyn Bridge*, *DeskLink*, *LapLink Pro*, *WinConnect*, and others.)

For example, if a PC on a LAN has the drive F: mapped to a server, you might use a file-transfer program to tell your laptop's operating system to refer to that PC's F: drive as your D: drive. You could then use DOS commands

on drive D: and direct application programs to read and write files to your D: drive.

In this scenario, your commands and file requests go out through the laptop's parallel or serial port, over the connecting cable provided with the file-transfer program, and into the desktop PC. A TSR in the desktop PC, not larger than 45K, redirects the incoming data to the operating system of the desktop PC. Since the desktop's operating system is already modified by the LAN operating system, the computer again redirects the data out through the LAN adapter, and you gain network access.

The only major drawback of this approach is that the networked PC would have to load another driver in CONFIG.SYS. If space allowed, this driver could be loaded into high memory.

The network throughput the laptop enjoys in this configuration depends a great deal on the activity on the networked PC. If the networked PC is not running other programs with a lot of disk, keyboard, or communications port activity, the laptop may experience throughput almost as fast as that from an external LAN adapter. But even the simultaneous use of the PC's keyboard could significantly slow the transfer of data from the surrogate LAN adapter. ■

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CONNECTIVITY TOKEN-RING ADAPTERS

chip set, the parallel ports will be able to communicate at speeds up to 2 MBps. These speeds are roughly 10 to 30 times as fast as existing parallel ports and are equivalent to the speed of an 8-bit card. If external adapters can match the network connection speed of an internal LAN card, this will remove one of the few remaining reasons to consider the high-priced (\$500 to \$1,500) laptop docking stations or expansion units that connect to the laptop's internal system bus.

The high-speed parallel-port interfaces will be available in portables from Advanced Logic Research Inc., AST Research Inc., Dell Computer Corp., GRiD Systems Corp., NEC Technologies Inc., and Zenith Data Systems, according to a Xircom spokesperson. All Xircom adapters will be able to take advantage of the faster speeds automatically, and adapters from other companies should be able to work with new drivers. The technology

also could be applied to desktop PCs to permit quicker laptop-to-desktop file transfers using products such as Traveling Software's *LapLink*.

EASY LAN LINKS

The laptop PCs that many people tote around are packed with nearly the same processing power and storage capacity found in desktop PCs. It's not surprising that an increasing number of people use the same lightweight, expensive portable in the office, at home, and on the road. External adapters find their way into the office portion of this scenario. Since you rarely need to attach to a LAN at home or on the road, it makes sense to put the LAN adapter in an external box that you can leave on your office desk and quickly plug into place. You can load the needed driver through a batch file.

Ease of installation is largely responsible for the crossover of external adapters into the desktop PC market. When you install an internal LAN adapter in an



EDITORS' CHOICE

■ RingPocket 4/16

Although Xircom created the pocket LAN adapter category, the king of the hill now is Accton Technology Corp.'s \$799 RingPocket 4/16. This superb external Token-Ring adapter has the lowest price, the fastest speed, and the greatest flexibility among the 4Mb/16Mb parallel-port adapters we tested. The RingPocket is also quite compact, with a 1.3-pound total weight for the adapter and power supply.

There are some situations where the RingPocket is not the external Token-Ring adapter of choice. If you have a Toshiba 2000 series or any of the older Toshiba laptop models with expansion bus connectors, you'll get better speed with the Megahertz External Token Ring Adapter. The Megahertz's direct bus connection provides a much higher throughput rate than would be possible through a parallel-port connection (20 to 44 percent faster). And if you want to print through your parallel port without disconnecting the LAN adapter, you should consider the

Xircom External Token Ring Adapter: a small, freestanding box that includes a printer port shared with the network connection. If you want to share your parallel port, you can also buy Xircom's \$99 parallel-port multiplexer.

Keep in mind a technological improvement that could make external network adapters virtually as fast as internal adapters. Xircom has developed a modified, bidirectional parallel port capable of at least ten times the speed of existing printer ports. Look for it first on 25-MHz SL-powered laptop computers later this year.

Finally, a caution on what you shouldn't infer from this review. These companies also market Ethernet, ARCnet, and 4-Mbps-only Token-Ring portable LAN adapters. Because performance is so heavily influenced by the adapter chip set and driver design, you cannot judge the relative quality or performance of those products by the 4Mb/16Mb results in this review.

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expansion slot, you must hunt for a free IRQ line, find an I/O address unencumbered by video ROM, work around conflicts caused by other expansion boards, and hope that the PC's BIOS does not take an immediate disliking to the driver software. Then you have to configure the driver and see if it works.

When you install an external LAN adapter, the IRQ line and I/O address are always free, and you know the installation will work every time. For these reasons, many people choose external adapters for networked PCs that run word processing, spreadsheet, and other office software. External adapters also are the favorite tool of anyone in a PC support center with the job of configuring stand-alone PCs. You can put the “standalone” PC on the LAN in a minute and quickly copy entire directories of fully configured programs from a server.

ON THE DOWNSIDE

Except for the Megahertz adapter, the external adapters in this review connect through the parallel port. There are two disadvantages associated with this approach: It ties up the parallel port, and it necessarily reduces the throughput to the PC. In many instances, the parallel printer port is not missed, because the network connection provides access to the LAN's shared printers. But if you must maintain a parallel-port connection, perhaps for a direct attachment to a plotter or some other output device, you'll want to consider the larger adapters, IQ Technologies' p.LAN and Xircom's External adapter. Both provide an extra parallel port that shares its access to the bus with the LAN connection and operates on a first-come-first-served basis. You get either/or service, but for most people who require a parallel connection, this is the best option short of buying an extra I/O card.

Limited throughput, the other potential drawback of external adapters, is usually a problem only in the mind of the user. The four adapters that rely on the parallel port all posted very similar numbers; the slowest of these still moved complex and inefficient packets of data—typical of PC applications—at nearly 400 kilobits per second. That is nearly twice as fast as you would receive the same data from the hard disk of an older IBM PC AT, and is fast enough to load even large applications in less than a second.

Yet the parallel-port adapters' throughput is only about 50 to 60 percent of an internal LAN adapter's under identical circumstances. Because loading a program moves a lot of data, the limitations in throughput are most visible when people start their applications. It is generally good practice to load applications on local drives to reduce network overhead, especially when using programs with large overlay files such as word processing programs. This becomes a particularly good idea if the networked PC works through an external LAN adapter.

The Megahertz adapter is the only product in this roundup that does not connect to the PC through its parallel port. Drawing on its experience in designing internal modems customized for laptop PCs, Megahertz Corp. created an external Token-Ring adapter that uses the 100-pin interface designed for the docking station on Toshiba's T1000LE, T1000SE, T1000XE, T1200XE, and entire T2000 series. Because of its design, the Megahertz achieves much higher throughput than the other adapters; its performance is similar to that of an internal adapter. But Megahertz had to do a bit of extra work to achieve this performance. Following the initial poor performance of the Megahertz adapter, the company provided a new set of adapters with modified internal specs for our retests.

PRODUCT CONSIDERATIONS

Like all Token-Ring adapters except those made by IBM and D-Link, the products we reviewed use Texas Instruments' TMS-380C16 Falcon chip set; their internal components are largely the same. The factors to consider when selecting an external adapter include the availability of the right network drivers for the operating system or systems you use, the amount of memory those drivers require, the type of wiring interface available on the adapter, and the product's size and shape. The ability to get technical support and software updates from a dealer or the manufacturer is also important.

The primary difference among these external LAN adapter products is in their software. All of these products support *LAN Manager*, NDIS (Network Device Interface Specification), and *NetWare* for DOS and OS/2. But in addition to matching the drivers and operating system, you should look at the size of the stack of

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TOKEN-RING ADAPTERS

driver software you'll need. There can be a wide difference between the software requirements of different products. For example, Xircom's software, manufactured by Madge Networks, eliminates the need to buy a \$292 copy of the *IBM LAN Support Program* for each PC.

Wiring can also be an issue. Xircom's Pocket adapter provides only a 9-pin connector for shielded Token-Ring wiring. If you use unshielded twisted-pair wire, you can use an adapter called a media filter, but such devices typically cost about \$50 and add complexity to the system. If you want to use unshielded twisted-pair wiring, then buy a product that has an RJ-45 connection on-board, such as the RingPocket, the Megahertz, or Xircom's External adapter.

The two larger products, from IQ Technologies and Xircom, connect to the PC's parallel port through a cable, while the RingPocket and Xircom's Pocket adapter make a direct physical attachment to the parallel port. The cable-connected units tuck away out of sight or next to the PC, where their indicator lights provide visual proof of the LAN's operation.

UNFOUNDED RUMORS

An inaccurate but frequently heard piece of computer lore warns that adding external adapters to a Token-Ring network can slow down its operation. This fallacy probably evolved from the mistaken combination of two unrelated facts. Every node on a Token-Ring network does examine and repeat the token, and PCs do get data from the network more slowly when connected through their parallel ports. But the token is initially examined by the adapter and not by any software running on the PC; it is not actually passed through the parallel port. Our tests demonstrated that on a network including five external adapters, the token-passing rate remained nearly the same when we replaced those external adapters with high-quality internal versions. Take note: External LAN adapters do not slow down the token rotation!

These 4Mb/16Mb external Token-Ring adapters are a good investment for any organization that needs to put laptop or desktop computers on a Token-Ring LAN. They are competitively priced with internal adapters, and they offer both ease of use and ease of installation that internals cannot touch.

CONNECTIVITY

TOKEN-RING ADAPTERS

ACCTON TECHNOLOGY CORP. RingPocket 4/16

All reviews by Joe Salemi

The \$799 RingPocket 4/16, Accton Technology Corp.'s first Token-Ring adapter, deserves to be described in superlatives. It is the least expensive of the five external 4Mb/16Mb Token-Ring adapters reviewed here, and shares the honor of being the fastest parallel-port type with the Xircom External Token Ring Adapter. It is not the smallest; it is the most flexible.

The size contest is a close one. Weighing in at just under 5 ounces, Accton's adapter is virtually the same size and weight as the smallest adapter, the Xircom Pocket Token Ring Adapter; both products' size and weight statistics are on the order of a pocket modem's. Accton packs connectors for both IBM Type 1 (9-pin D-type) and Type 3 (RJ-45) cables into the RingPocket's petite package, while Xircom's Pocket adapter comes with but one Type 1 connector. The RingPocket's larger external power supply makes the adapter 3 ounces heavier, but like the additional connection, this feature brings added flexibility.

The RingPocket's power supply is a brick-type unit (similar to the power supplies that come with laptop systems), with a separate power cord that plugs into it. A

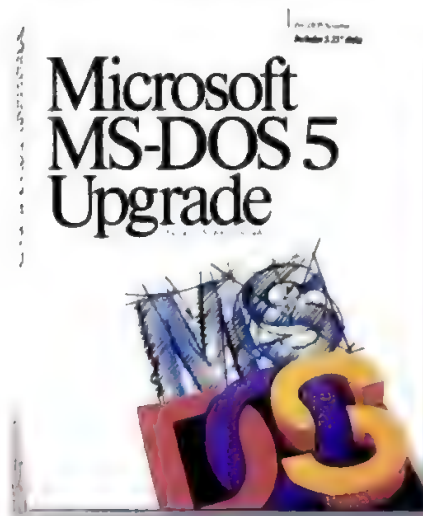
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FACT FILE

EDITORS' CHOICE

RingPocket 4/16

Accton Technology Corp., 46750 Fremont Blvd., #104, Fremont, CA 94538; 800-926-9288, 510-226-9800.

List Price: \$799; IBM LAN Support Program drivers, \$49.

Requires: 24K RAM, parallel port.

Compatible With: LAN Manager, NDIS, NetBIOS, NetWare 2.15 through 3.11.

In Short: Size, flexibility, and performance make the RingPocket 4/16 the best choice for connecting laptop and notebook systems to a LAN. The low price even makes the RingPocket an attractive alternative to an internal adapter in situations where the slower performance of a parallel port is not a critical factor.

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LED on the brick indicates power-on. This design takes up more desk space than the cube-style power supplies provided with the other adapters, but it has a major advantage for those whose travels take them overseas: The power supply automatically detects the supplied voltage and frequency. The other adapters we tested all have separate models for 220-volt use.

The adapter design is simple. A sliding switch on the side of the hard-shell plastic case controls which connection port is active. Three green LEDs on the top of the unit indicate the active speed and successful insertion into the ring. Two knurled knobs on the parallel-connection end tighten the screws that secure the unit to the PC's parallel port. The RingPocket has no pass-through parallel port, and Accton does not make a parallel-port multiplexer, but we found that Xircom's multiplexer works fine with this unit.

The interface software is written by Accton, and drivers are provided for *LAN Manager*; *NetBIOS*; *NetWare*, Versions 2.15 through 3.11; and networks that support NDIS (the Network Device Interface Specification). *IBM LAN Support Program* drivers are available as a \$49

CONNECTIVITY TOKEN-RING ADAPTERS



Accton Technology Corp.'s \$799 RingPocket 4/16 packs quite a few extras into a tiny package. The 5-ounce adapter contains connectors for both IBM Type 1 and Type 3 cables. This flexible little adapter is fast and inexpensive.

option. While no TCP/IP drivers are provided, Accton's technical support department will work with the user to adapt the provided drivers to the common TCP/IP-interface programs. The unit is under a two-year parts-and-labor warranty; support is provided through a toll-free num-

ber and a BBS. Accton does not make a 4Mb external Token-Ring adapter, so there is no need for an upgrade plan.

Installing the adapter is easy, and the manual provides details on connecting the adapter to the PC and setting up the various drivers. The *NetWare* drivers we tested are provided as .OBJ files for use with the Novell SHGEN or WSGEN programs. The network speed is established when you create IPX.COM, which sets the adapter to the proper speed when it is loaded. Some limited diagnostics are performed when the driver loads; they indicate if the adapter is not connected or if insertion into the ring is not successful. A complete diagnostics program is included on the driver disk. The IPX we generated for *NetWare* 3.11 took approximately 24K of RAM; only the Xircom drivers were smaller.

The RingPocket was the fastest of the parallel-port adapters on our benchmark tests. Xircom's External adapter posted faster times on a couple of tests, but the RingPocket won on the more telling tests, and its speed advantage increased with the network load. As with all the parallel-port adapters, the RingPocket's throughput



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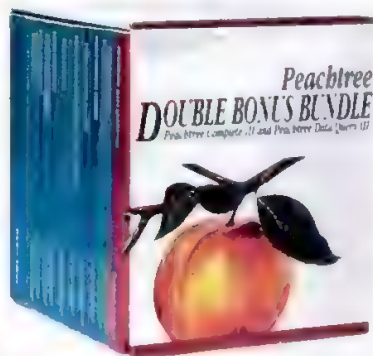
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decreased gradually as more adapters were added to the network. The 100-kilobit-per-second difference in throughput between one adapter and six is strikingly smaller than that of the internal adapters we tested, which regularly lose half their throughput by the time six adapters are added to the load.

With connectors for both types of Token-Ring cables, an international power supply, and the ability to plug into any PC's parallel port, Accton's RingPocket 4/16 is the most flexible and portable of the external Token-Ring adapters on the market today. Its list price is less than that of most internal 4Mb/16Mb adapters. In situations where performance is not a factor, you'll find the RingPocket an excellent value even for day-to-day use on a desktop PC.

IQ TECHNOLOGIES INC. p.LAN 16/4 Token-Ring Adapter

At almost 2.5 pounds with its power supply, IQ Technologies' \$995 p.LAN 16/4 Token-Ring Adapter is the heaviest of the external adapters. This is justifiable, as it is intended more as a desktop LAN connection than a portable one; extra features and flexibility compensate for the extra weight. What really weighs down the p.LAN is its slow speed, its time-consuming configuration requirements, and its large workstation drivers.

The first thing you notice about the



p.LAN 16/4 Token-Ring Adapter

IQ Technologies Inc., 22032 23rd Dr. SE, Bothell, WA 98021; 800-752-6526, 206-483-3555.

List Price: \$995

Requires: 55K RAM, parallel port.

Compatible With: IBM LAN Support Program 1.3, LAN Manager 2.0, LAN Server, LANtastic, NetBIOS, NetWare 2.1 through 3.11, TCP/IP, 3+Open 1.1, VINES.

In Short: The p.LAN 16/4 Token-Ring Adapter performs acceptably as a desktop LAN connection for a laptop system or as a permanent connection for a desktop PC. But its high RAM requirements, weight, and cumbersome installation procedure make the p.LAN less appealing than its competitors.

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CONNECTIVITY TOKEN-RING ADAPTERS

p.LAN adapter is its array of connection options. On the back of the adapter are 9-pin and RJ-45 connectors and a pass-through parallel port for a local printer. Configuring the Token-Ring port is not easy, however. The p.LAN adapter defaults to the 9-pin port; to change it to the

RJ-45 port, you have to remove four screws from the bottom of the metal case, slide off the top, and change a set of jumpers. The manual uses precise diagrams to explain how to do this, but it's still a more involved process than any of the other reviewed adapters require.

Once you have decided which port to use, the p.LAN's installation process

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Model	Application	List
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NEW Back-UPS 450	Tower 386, 486 systems, servers	\$329
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CONNECTIVITY

TOKEN-RING ADAPTERS



Designed for desktop use, the \$995 p.LAN 16/4 Token-Ring Adapter, from IQ Technologies, is the heaviest adapter in this roundup. It's encumbered by time-consuming configuration requirements and large workstation drivers.

becomes somewhat easier. The p.LAN connects to the PC through a short attached parallel cable, which gives the user some flexibility in placing it on the desk. Its power supply is the cube type; a separate model, available for the same price, supports 220 volts.

The front of the adapter has four LED lights that provide a measure of diagnostics; they indicate network traffic, an active computer connection, ring insertion, and data sends to the network or the printer. The software drivers also provide a level of diagnostics by verifying that all the connections are active and that the adapter is properly inserted into the ring. Additional diagnostics are available through a provided software utility.

The adapter's speed is set via a command line option on the p.LAN software driver. This driver is loaded as part of the workstation's CONFIG.SYS file and, with the addition of the usual IPX driver, is the reason behind the large amount of RAM the p.LAN adapter uses. The .SYS file requires approximately 36K of RAM; in order to connect to the LAN, an *IBM LAN Support Program* IPX driver must be generated as well. The combination of the p.LAN driver and the IPX driver takes up a whopping 55K RAM, which is more than double the other adapters' requirement.

The adapter device driver is actually one portion of the *IBM LAN Support Program* drivers. The entire set of drivers must be purchased separately if you need NetBIOS support. But for other networking software, the p.LAN device driver that comes with the adapter can be the

only one loaded; the rest of the IBM drivers are not needed.

IQ Technologies is second only to Xircom in the number of network drivers it provides. The list includes *IBM LAN Support Program* 1.3, *LAN Manager* 2.0, *LANtastic*, *NetWare* 2.10 through 3.11, *TCP/IP*, *3+Open* 1.1, and *VINES*. Some of these drivers were cowritten with Designers Work Bench. Although IQ Technologies claims NDIS support, we could find no reference to NDIS drivers in the manuals or on the driver disks.

The p.LAN's performance was acceptable on our tests, though it wasn't the fastest. The low throughput drop-off was consistent with that of the other adapters: The scores varied about 100 kilobits per second between the tests on one adapter and those on six.

The adapter comes with a two-year parts-and-labor warranty, and support is provided through a toll-free number and a BBS. IQ Technologies also provides upgrades by offering owners of its slower 4Mb adapter a credit for the price they paid.

The p.LAN Token-Ring Adapter is solidly built and can adequately serve either as a desktop station for laptop systems or as a permanent LAN connection for a desktop PC. But its high RAM requirements and cumbersome installation and configuration routines make it less of a value than the competing Xircom External Token Ring Adapter.

MEGAHERTZ CORP.

Megahertz External Token Ring Adapter

The Megahertz External Token Ring Adapter has one big difference from the other adapters in this review: It's designed to attach to the expansion-bus connector of Toshiba laptop and notebook computers. Due to its direct connection to the bus, this external Token-Ring adapter proved to be almost as fast as an internal card. It is a good choice for those who wish to have something close to full desktop performance from their Toshiba laptops.

At \$999, the Megahertz adapter's price is in line with its more complex parallel peers. In addition to the Toshiba 2000SX



The Megahertz External Token Ring Adapter has an appeal only for Toshiba owners. But when hooked up to a Toshiba expansion bus connector, the \$999 adapter approaches full desktop functionality.

on which we tested it, the adapter supports the T1000LE, T1000SE, T1000XE, T1200XE, and the entire T2000 series. Additionally, support for adapters in the Compaq LT/386 line has been announced. Megahertz Corp. also offers an internal laptop unit.

The external adapter attaches to the Toshiba expansion-bus connector through a flat ribbon cable. Due to the positioning of this cable, the whole unit must lie flat on the desk. The Megahertz takes up a good amount of desktop space; it is almost 9 inches long from the connector to the back. But since the cube-type power pack is optional, there is a different space and



FACT FILE

Megahertz External Token Ring Adapter
Megahertz Corp., 4505 South Wasatch Blvd.,
Salt Lake City, UT 84124; 800-527-8677,
801-272-6000

List Price: \$999.

Requires: 27K RAM, bus expansion connector.

Compatible With: *IBM LAN Support Program*, *LAN Manager*, *LAN Server*, NDIS, NetBIOS, *NetWare* 2.10 through 3.11, Unix LMX.

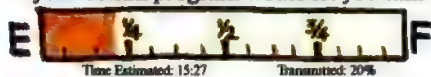
In Short: Although it is the most expensive of the external 4Mb/16Mb adapters, the Megahertz External Token Ring Adapter is ideal for those who use Toshiba laptops as their primary computers. Its abilities to connect directly to the bus and to draw on the laptop's internal power supply are definite advantages.

CIRCLE 610 ON READER SERVICE CARD

How To Get Into PC Communications Without Jumping Out Of Windows

You forget how wonderful Windows™ is until you have to exit it to transfer a file.

Since most communications software won't work in Windows, you're left sitting on your hands watching a "gas gauge" as your file transfer crawls from start to finish. If your comm program would let you take



advantage of Windows multi-tasking, then you could minimize it to a simple icon while you carried on with something else (like the spreadsheet you promised your boss an hour ago).

Well, with Crosstalk® for Windows you can.



It's All In The Background.

Not only does it keep you in the point-and-click world of Windows, but more importantly, it lets you establish connections, and send and receive files—all in the background. In fact, while you're busy on another project, Crosstalk for Windows can be answering calls, dialing a queue of numbers, transferring data or keeping a VAX® link open. Think about it.

You can prepare "The Big Presentation" on your Windows word processor while Crosstalk for Windows is calling Dow Jones News/Retrieval® and capturing stock information. Then, you can cut and paste the appropriate Dow Jones data right into your presentation. Or import it transparently through DDE. You can even automate repetitious jobs (like that daily call to collect data from branch offices) by writing scripts or using the Learn feature.

Nobody Does Windows Like Crosstalk.

Compare the "stars" from Software Digest.

- ★★★★ Crosstalk for Windows
- ★★★★ Smartcom III
- ★★★★ Procomm Plus
- ★★★★ DynaComm
- ★★★★ Asynchronous Edition
- ★★★ Relay Gold
- ★★★ MicroPhone II for Windows

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InfoWorld named it

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Software Digest

Vol. 7 No. 12 1990
Crosstalk for Windows

1990
Crosstalk for Windows



4-/16-MEGABIT EXTERNAL TOKEN-RING ADAPTERS: SUMMARY OF FEATURES

Products listed in alphabetical order by company name

	Accton RingPocket 4/16	IQ Technologies p.LAN 16/4 Token-Ring Adapter	Megahertz External Token Ring Adapter	Xircom Pocket Token Ring Adapter	Xircom External Token Ring Adapter
List price	\$799	\$995	\$1,099	\$895	\$945
PHYSICAL FEATURES					
Dimensions (HWD, in inches)	2.5 x 5 x 0.9	6.5 x 6 x 1.5	4.8 x 6 x 1.1	2.5 x 4.8 x 0.9	2 x 6 x 5
Can draw power from PC	☐	☐	☒	☐	☐
External AC power supply	☒	☒	☒	☒	☒
Weight of power supply (pounds)	1.0	0.9	1.0	0.8	0.8
Weight of adapter with power supply (pounds)	1.3	2.5	1.9	1.1	2.2
Token-Ring chip set	TI	TI	TI	TI	TI
Includes shielded twisted-pair connectors	☒	☒	☒	☒	☒
Includes unshielded twisted- pair connectors	☒	☒	☒	☐	☒
Indicator lights:					
Power-on	☐	☒	☒	☐	☒
Diagnostic	☒	☒	☐	☐	☐
Traffic	☐	☒	☐	☐	☒
Speed	☒	☐	☐	☐	☒
Uses standard parallel port	☒	☒	☐	☒	☒
Uses external bus connector	☐	☐	☒	☐	☐
ATTACHMENT TO PC					
Direct	☒	☐	☐	☒	☐
Cable	☐	☒	☒	☐	☒
CONNECTORS					
Includes built-in, pass-through parallel port	☐	☒	☐	☐	☒
Parallel-port multiplexer	☐	☐	☐	Optional (\$95)	☒
Connectors on tested unit:					
9-pin D-type	☒	☒	☒	☒	☒
RJ-45	☒	☒	☒	☐	☒
DIAGNOSTICS					
Automatic 4Mb/16Mb adjustment	☒	☒	☐	☐	☐
Power supply detects input voltage and AC frequency	☒	☐	☐	☐	☐
Separate 110v and 220v models	☐	☒	☒	☒	☒
Built-in tests	☐	☐	☐	☒	☒
Senses cabling type	☐	☐	☐	☐	☒

—Editors' Choice ☒ —Yes ☐ —No
 DWB—Designers Work Bench, TI—Texas Instruments Inc.

CONTINUES

weight savings. The Megahertz adapter is unique among the five reviewed here in that it can draw its power from the laptop's battery or power supply. A 220-volt version for international use is also available for the same price.

An on/off switch on the back of the adapter allows you to save battery power when the adapter isn't needed without having to disconnect it physically. Other switches on the back of the relatively light, hard plastic case select the network

Due to its direct connection to the Toshiba expansion bus, the Megahertz was almost as fast as an internal Token-Ring adapter.

speed and activate either the 9-pin or the RJ-45 port. A green LED on the top indicates when the unit is powered on.

The drivers for the Megahertz were written by Olicom, and they support IBM LAN Support Program, LAN Manager, LAN Server, and NetWare 2.10 through 3.11. Drivers are also included for NetBIOS networks, as well as for those that support NDIS. The unit's warranty is for five years; Megahertz provides support through a toll-free number and a

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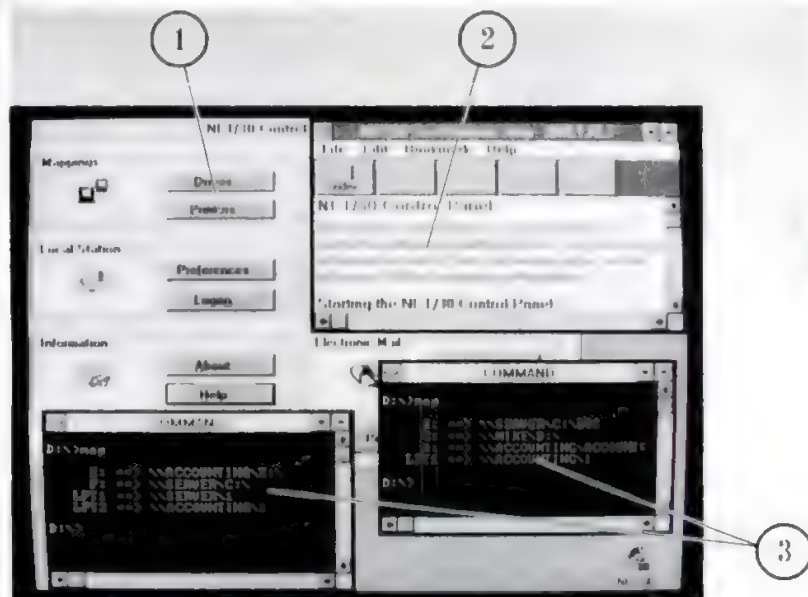
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S O F T W A R E



1. NET/30 Control Panel lets you take complete charge of the network. It exploits the Windows graphical interface to make network management a breeze. Access network disks and printers. View print queues. Control security. Monitor use of server resources. Send and receive electronic mail.
2. NET/30 Help System includes context-sensitive help plus a complete on-line reference manual. Hypertext lets you quickly find what you need.
3. This example shows how each DOS window can access a different set of network disks and printers. With NET/30, each DOS window is a separate network station. Run multi-user applications in several DOS windows while sharing data and resources. It's just like running on separate computers.

CIRCLE 228 ON READER SERVICE CARD



CONNECTIVITY

TOKEN-RING ADAPTERS

4-/16-MEGABIT EXTERNAL TOKEN-RING ADAPTERS: SUMMARY OF FEATURES

Products listed in alphabetical order by company name

	Accton RingPocket 4/16	IQ Technologies p.LAN 16/4 Token-Ring Adapter	Megahertz External Token Ring Adapter	Xircom Pocket Token Ring Adapter	Xircom External Token Ring Adapter
SOFTWARE DRIVERS					
Driver authorship	Accton	IQ/DWB	Olicom	Xircom/Madge	Xircom/Madge
Software drivers included:					
LANtastic	☐	☒	☐	☒	☒
LAN Manager	☒	☒	☒	☒	☒
NDIS	☒	☒	☒	☒	☒
NetBIOS	☒	☒	☒	☒	☒
NetWare:					
2.2	☒	☒	☒	☒	☒
3.11	☒	☒	☒	☒	☒
Other	2.15, 3.10	2.1x, 3.10	2.1x, 3.0, 3.10	None	None
TCP/IP	☐	☒	☐	☒	☒
VINES	☐	☒	☐	☒	☒
Other	None	PC LAN 1.2 and 1.3, 3+Open	None	Nexos, PC-NFS, Tapestry III	Nexos, PC-NFS, Tapestry III
Auto-configuring network drivers	☐	☐	☒	☒	☒
Interface for IBM LAN Support Program	Optional (\$49)	☒	☒	☒	☒
MEMORY					
Minimum RAM required	24K	55K	27K	9K	9K
Uses extended or expanded memory	☐	☐	☐	☐	☐
DISTRIBUTION					
Dealer	☒	☒	☒	☒	☒
VAR	☒	☒	☒	☒	☒
Direct	☐	☐	☐	☐	☐
Distributor	☒	☒	☒	☒	☒
TECHNICAL SUPPORT					
Toll-free number	☒	☒	☒	☒	☒
Hours	8:00-5:00 M-F P.S.T.	7:00-6:00 M-F P.S.T.	8:00-5:00 M-F M.S.T.	8:00-5:00 M-F P.S.T.	8:00-5:00 M-F P.S.T.
On-line service	BBS	BBS	CompuServe	BBS	BBS
Warranty	2 years on hardware; software updates on request	2 years	5 years	2 years	2 years
DOCUMENTATION					
Table of contents	☒	☒	☒	☒	☒
Index	☐	☐	☒	☐	☐
Diagrams	☒	☒	☒	☐	☐
Screen shots	☐	☐	☒	☐	☐
Error-message listing	☒	☐	☐	☒	☒

—Editors' Choice

☒—Yes

☐—No

DWB—Designers Work Bench, TI—Texas Instruments Inc.

ENDS

section on CompuServe's PCVENC forum. At the time of this writing, Megahertz had not finalized a policy for upgrading users of its older 4Mb Token-Ring adapter to the 4Mb/16Mb one.

The installation manual makes it simple to set the switches and install the adapter; a separate manual explains the driver configurations and setup. SHGEN or WSGEN is used to create the appropriate NetWare IPX driver, which took up approximately 27K of RAM on our test-bed

Though the Megahertz takes up some desk space, it can draw from the laptop's power supply so you won't need the power pack.

Toshiba 2000X machines. Simple diagnostics are performed by the driver when it is loaded, indicating whether the adapter is present, active, and inserted into the ring; a complete diagnostics program is also included.

On our initial tests, the adapters exhibited major performance problems. A single Megahertz adapter on the ring performed as we expected, with throughput results virtually identical to those of the internal adapter we used as a reference. When we

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CIRCLE 194 ON READER SERVICE CARD

CODE A1801



BENCHMARK TESTS: 4Mb/16Mb EXTERNAL TOKEN-RING ADAPTERS

4Mb/16Mb external Token-Ring adapters that use the parallel port (Accton, IQ Technologies, and Xircom) provide between 50 and 80 percent of the efficiency of an internal network card. Adapters that connect directly to the external bus of a laptop, such as Megahertz's, run as fast as an internal card. As LAN traffic increases, the perceived differences in performance among external, external bus, and internal adapters decrease, but they don't disappear.

WHAT THE NUMBERS MEAN

The performance of the external adapters on our tests shows the comparatively low level of throughput provided by an adapter that uses the parallel port instead of attaching directly to the bus. The direct bus attachment always provides higher throughput than the parallel-port connection. External parallel-port adapters start out slower than internal network adapters and bus-attachment adapters, but their performance level doesn't fall as quickly as network load increases.

The external adapters we reviewed fall into two categories. Because it was designed to attach directly to the external bus on Toshiba laptops, the Megahertz External Token Ring Adapter stands alone as a bus-based approach. The other four products follow the traditional approach and take advantage of the ports already available in the PC.

On all of our tests, the Megahertz adapter performed on a par with the internal adapters used in our baseline machines. With one load station on the network, the Megahertz was 44 percent faster than the parallel-port adapters. That lead dropped down to a mere 20 percent faster by the time five load stations were actively using the network.

Of the true external adapters that use the parallel port, the Editors' Choice-winning RingPocket posted the highest throughput on the No Load evaluation. But the RingPocket's advantage over the p.LAN and both of Xircom's adapters

wasn't overwhelming. The RingPocket produced an average of 0.3 to 0.4 MB of additional data throughput on the tests with three or more active load workstations.

The two adapters from Xircom should have performed identically because they

Of the parallel-port adapters, the RingPocket posted the highest throughput, but not by much.

had the same drivers and chip set. The physically larger Xircom External Token Ring Adapter was slightly slower than the Xircom Pocket Token Ring Adapter. The External adapter attaches to the port by a cable rather than directly, a possible source of line noise. A retest produced the same results. The differences fall within the realm of unit-to-unit variations and shouldn't affect real-world performance.

Note the consistency of the true

external adapters' performance on all of the tests. These parallel-port adapters only lost around 100K of throughput as the network load increased. In comparison, on all of our tests, the performance of bus-based approaches employed by Megahertz and the internal adapters in our baseline Compaqs degraded by almost half as the network load increased from one to five active stations. The parallel-port adapters were always slower, but the difference in speed decreased as the network got busier.

In addition to measuring throughput, one of our main testing goals was to investigate whether adding an external adapter to a Token-Ring network would slow the whole network down. Rumor and speculation suggested that token passing might be delayed because the external adapters use the PC's 40K-per-second parallel port. This port offers a throughput capacity a few orders of magnitude lower than the 4MBps rate of the PC's I/O bus. We used a Novell LANALYZER LAN monitor to measure the token's rotation time as it was passed around the ring. The monitor indicated that it took an average of 5 to 7 microseconds for the token to be passed when there were between one and six external adapters on the network. This was roughly the same time that the token took to travel around our baseline Compaq network.

CONTINUES

added the second Megahertz, throughput dropped noticeably (though it still was better than the figure for two parallel adapters), but the token latency score rose to the same level as the score for six parallel adapters. (Token latency is the time it takes for a token to be passed around the network ring.) With additional adapters, throughput degenerated to below that of all the other tested products, and latency rose again. We advised Megahertz of the problem, and within three weeks of our initial tests, the company provided us with new units.

On the second series of tests, the Megahertz adapter's performance im-

Initially, the Megahertz had major throughput problems, but changes by the company put the unit at the top of the chart.

proved tremendously. The improvements that Megahertz made solved the initial problems and placed the adapter at the top

of the performance chart. In fact, the Megahertz adapter's performance was consistently just slightly below that of the internal Token-Ring adapters used as the baseline for comparison; token latency was also within our expected limits.

Because it provides throughput virtually identical to that of an internal adapter, the Megahertz External Token Ring Adapter is ideal for those who use a supported laptop as the primary computer, both in and out of the office. Its warranty is extremely generous, and its ability to draw power from the laptop reduces the clutter of multiple power supplies on the desk or in the carrying case.

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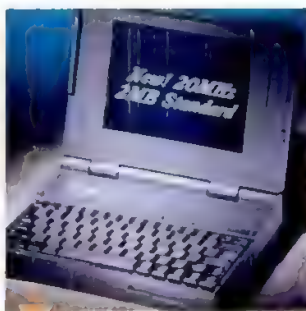


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BENCHMARK TESTS: 4Mb/16Mb EXTERNAL TOKEN-RING ADAPTERS

HOW WE TESTED



Figure 1

We performed these tests on a network with three components: a server, baseline stations for comparison, and load stations for testing. The server comprised a Compaq 486/33 System Pro with 16MB of RAM and a Compaq 4Mb/16Mb Token-Ring internal card adapter set at 16 Mb and running NetWare, 3.11. The five baseline stations were Compaq/16MHz/N PCs, each with 5MB RAM and a Proteon 1390 4Mb/16Mb Token-Ring internal adapter running at 16Mb. The five load stations were Compaq/16MHz/N PCs with the tested external adapters from Accton, IQ Technologies, and Xircom attached through their parallel ports. The Megahertz adapter required an attachment to the expansion bus of a Toshiba laptop; we tested it on a Toshiba 2000SX. Test results for parallel-port adapters were unaffected by using desktop PCs rather than laptops.

For testing, each company supplied six 4Mb/16Mb Token-Ring adapters to run on our load stations and software drivers to

create the shell required for NetWare 3.11.

We measured the performance of the 4Mb/16Mb external adapters using PC Magazine LAN Labs' benchmark tests. Five of the six baseline Compaq 386/Ns with the 4Mb/16Mb Token-Ring adapters simulated a small Token-Ring Network; the sixth served as a throughput station to measure the amount of data transferred between the workstations and the server (Figure 1). To add background network traffic during the data exchange between the tested workstations and the server, we ran

the Hard Disk Access Load test and the Directory Access Load test separately on the five baseline workstations.

To gauge the effect of using external adapters on the network, we added the load stations to the baseline network one by one. We ran the Hard Disk Access Load and Directory Access Load tests on the load stations and measured the throughput to the server (Figure 2).

The tables present a snapshot of the throughput measured on the throughput station when the load stations were being used. The first table represents the throughput when the load stations were running the Hard Disk Access Load test, and the second table shows the throughput when the load stations were running the Directory Access Load test.

The Workstation Throughput Evaluation test provides the best picture of how the adapters performed.

CONTINUES

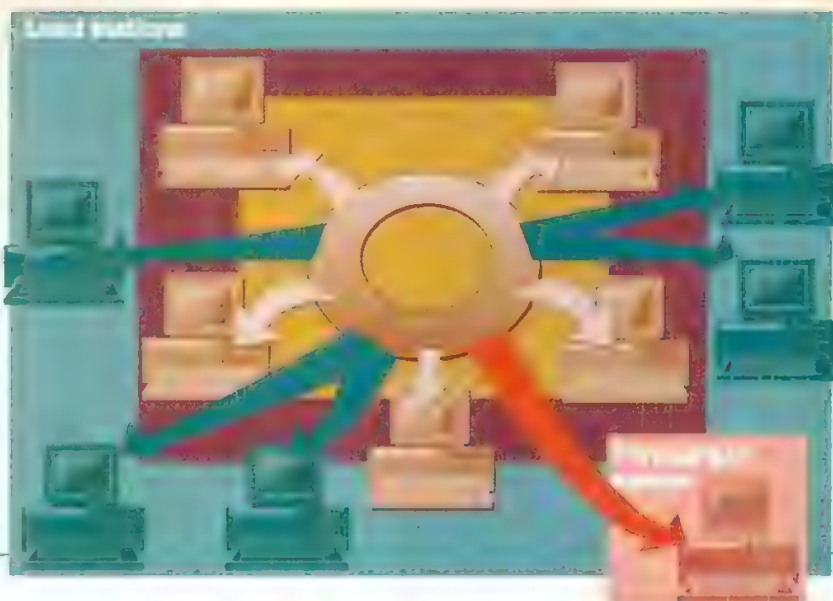


Figure 2

XIRCOM INC.

Xircom Pocket Token Ring Adapter Xircom External Token Ring Adapter

Xircom, the company that introduced the first successful external network adapter back in 1989, checks in here with two external 4Mb/16Mb Token-Ring adapt-

ers. What makes the pair stand out is their minimal use of workstation RAM and their easy installation. The \$895 Xircom Pocket Token Ring Adapter is the lightest of the five adapters reviewed; it beats Accton's RingPocket by only 0.3 ounces. Unfortunately, the Pocket comes with only a 9-pin connector, and it requires the use of Xircom's optional \$99 parallel-port multiplexer to print on a local printer while connected to the LAN.

For an extra \$50, the larger Xircom External Token Ring Adapter (\$945) provides much more flexibility. Besides coming with both 9-pin and RJ-45 con-

*Xircom's network
drivers use a minimum
of RAM and still provide
good performance.*

nections, the External adapter has a pass-through parallel port for a local printer. Like the p.LAN adapter, the External adapter is designed more for permanent

CONNECTIVITY

TOKEN-RING ADAPTERS

BENCHMARK TESTS: 4Mb/16Mb EXTERNAL TOKEN-RING ADAPTERS

PC Magazine LAN Labs' benchmark tests are written in C and are independent of commercial software. Each load station operates at a rate many times that of a PC in even a heavy-use environment. Since each workstation running the load test simulates the activity of 10 to 15 PCs, the real effect on the network is something around 150 workstations in operation.

The **Workstation Throughput Evaluation** test reports the throughput recorded on a single PC during the performance of a standardized task on the network, and is run in conjunction with the Hard Disk Access Load test or the Directory Access Load test. The test program performs a sequential read, a random read, a sequential write, and a random write using a 1MB file. The record size

systematically rotates among 16K, 4K, and 512 bytes. The throughput is reported in megabits per second.

The **Hard Disk Access Load** test reads random blocks of data in 1K increments from a 10K file on the server. The results of this test are reported in requests per second for all the PCs running the load test. The test begins and ends at the same time as the Workstation Throughput Evaluation test.

The **Directory Access Load** test makes the server repeatedly search for a nonexistent file. Since the file allocation table in most network servers is typically cached, this request causes a fast read to the cache. The repeated retries created by the client PCs generate a heavy load on the server's CPU. This test provides a general-purpose method of loading the server's CPU in the fashion of a resident task, such as a network-monitoring program or a communications program. The results for this test are reported in requests per second for all the PCs running the load test. The test begins and ends at the same time as the Workstation Throughput Evaluation test.

* Numbers reported for comparison.

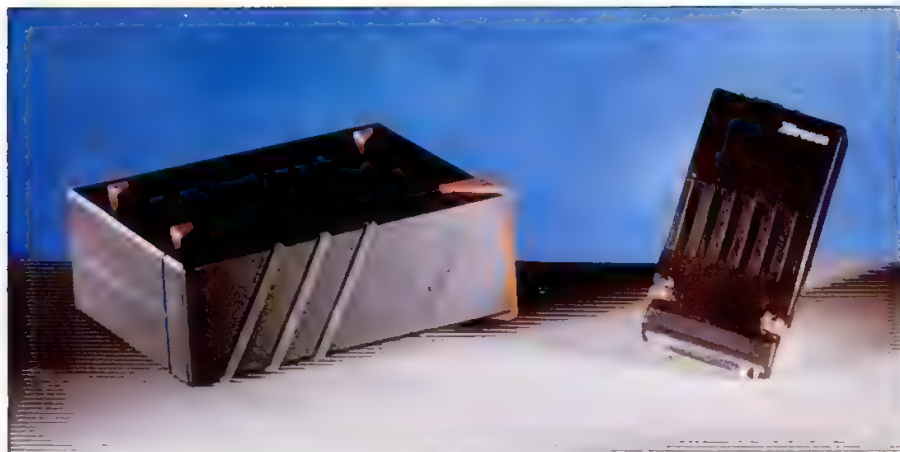
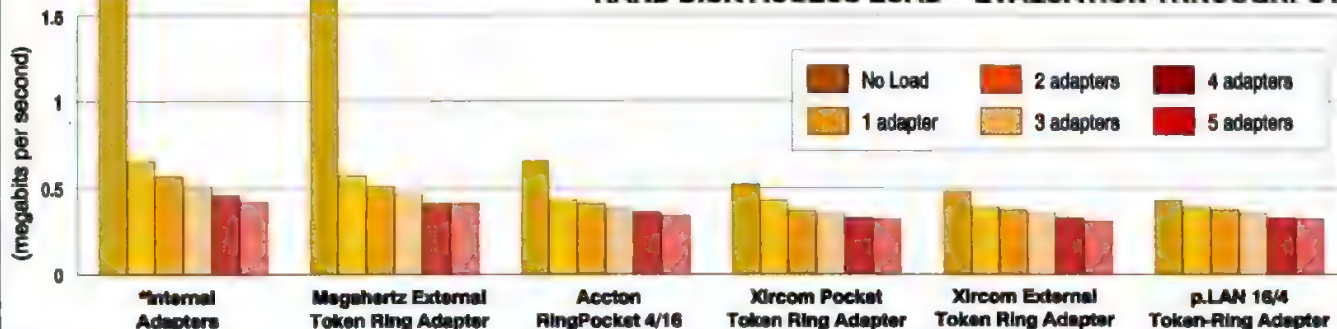
HARD DISK ACCESS LOAD Workstation Throughput Evaluation (megabits per second)

	No Load	NUMBER OF ADAPTERS				
		1	2	3	4	5
*Internal Adapters	1.73	0.66	0.57	0.51	0.46	0.42
Megahertz External Token Ring Adapter	1.62	0.57	0.51	0.46	0.41	0.41
Accton RingPocket 4/16	0.66	0.43	0.41	0.38	0.36	0.34
Xircor Pocket Token Ring Adapter	0.52	0.43	0.37	0.35	0.33	0.32
Xircor External Token Ring Adapter	0.48	0.39	0.37	0.35	0.33	0.31
p.LAN 16/4 Token-Ring Adapter	0.43	0.39	0.37	0.35	0.33	0.32

DIRECTORY ACCESS LOAD Workstation Throughput Evaluation (megabits per second)

	No Load	NUMBER OF ADAPTERS				
		1	2	3	4	5
*Internal Adapters	1.73	0.72	0.63	0.57	0.51	0.47
Megahertz External Token Ring Adapter	1.62	0.66	0.55	0.5	0.46	0.46
Accton RingPocket 4/16	0.66	0.44	0.41	0.38	0.36	0.34
p.LAN 16/4 Token-Ring Adapter	0.52	0.39	0.37	0.36	0.34	0.32
Xircor External Token Ring Adapter	0.48	0.39	0.37	0.35	0.33	0.32
Xircor Pocket Token Ring Adapter	0.43	0.39	0.37	0.35	0.33	0.32

HARD DISK ACCESS LOAD — EVALUATION THROUGHPUT



Both of the products offered by Xircor, the company that invented the external adapter concept, come with an outstanding selection of well-written drivers. Considered together with its power cube, the \$895 Xircor Pocket Token Ring Adapter is the lightest of the five adapters reviewed, but it only comes with a 9-pin connector. An extra \$50 for the larger Xircor External Token Ring Adapter gives you an additional RJ-45 connection, as well as a pass-through parallel port for a local printer.

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FACT FILE

Xircom Pocket Token Ring Adapter

Xircom Inc., 26025 Mureau Rd., Calabasas, CA 91302; 800-874-7875, 818-878-7600.

List Price: \$895.

Requires: 9K RAM, parallel port.

Compatible With: Attachmate Extra!, DCA IRMA, DECnet/Pathworks, IBM LAN Support Program, LAN Manager, LAN Server, NDIS, NetBIOS, NetWare 2.0a through 3.11, Nexos, PC-NFS, PC/TCP, STP software, Tapestry III, TCP/IP, VINES

In Short: A good solid performer that is easy to set up and install, the Xircom Pocket Token Ring Adapter features a wide variety of tightly written driver software. But its price, speed, and lack of a Type 3 connector are drawbacks; Accron's RingPocket may be a better choice for portable use.

CIRCLE 611 ON READER SERVICE CARD

CONNECTIVITY TOKEN-RING ADAPTERS

nal jumpers to set when configuring either adapter. For the Pocket version, you use the PTSET16 software utility to set the adapter's speed; the ETSET16 utility provided with the External model sets the speed and the Token-Ring connection port. The External adapter automatically senses the type of media to which it is connected (9-pin or RJ-45); the ETSET16 program can override this feature if it fails to work properly.

The configuration information is stored in each adapter's EPROM and needs to be reset only if you change the network speed or connection. Xircom codeveloped the SmartRing Token Ring drivers with Madge Networks—which explains how the drivers manage to use a minimum of RAM and still provide good performance. The SMARTIPX driver we used in our tests loads most of its code into the RAM on the adapter and leaves a paltry 9K behind in the workstation's RAM.

EASY INSTALLATION

The combination of software setup routines and auto-configuring drivers, backed

up by clear and concise manuals, makes these Xircom adapters the easiest to install among all of the units reviewed. Connect the adapter to the PC, plug in the cube-type power supply, run the setup utility, and load the network drivers, and you're up and running. Drivers for DECnet/Pathworks, IBM LAN Support Program, LAN Manager, LAN Server, NDIS, NetWare 2.10 through 3.11, TCP/IP, and VINES are among the many provided (NetWare 2.0a drivers are available directly from Xircom).

The Pocket adapter is the picture of simplicity; there are no indicator lights on its hard-shell plastic case, and the two knobs for tightening the connection are far enough back from the parallel port to turn with ease. The network driver provides some diagnostics when loaded, and a full diagnostic program is included on the disks.

The Pocket adapter's performance is quite acceptable; it ran neck and neck with the p.LAN adapter on our tests. And the Pocket's throughput with six adapters was less than 100 kilobits per second slower than with one adapter, a difference that is hardly noticeable under normal LAN

desktop use than for portability, and it connects to the PC via a cable. Both Xircom adapters come with the widest variety of preconfigured network drivers, which install right out of the box with a minimum of fuss.

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FACT FILE

Xircom External Token Ring Adapter

Xircom Inc., 26025 Mureau Rd., Calabasas, CA 91302; 800-874-7875, 818-878-7600.

List Price: \$945.

Requires: 9K RAM, parallel port.

Compatible With: DECNet/Pathworks, IBM LAN Support Program, LAN Manager, LAN Server, NDIS, NetWare 2.0a through 3.11, Nexos, PC-NFS, Tapestry III, TCP/IP, VINES.

In Short: Its flexibility makes the Xircom External Token Ring Adapter the best choice for desktop use. Though heavier than the Xircom Pocket Token Ring Adapter, the External adapter justifies the extra pound by its greater functionality and only slightly higher price. The system includes a parallel-port printer connection.

CIRCLE 612 ON READER SERVICE CARD

usage. On all the tests, the External adapter performed on a par with the Pocket adapter, no doubt because both use the same drivers.

The 2.1- by 6.2- by 5.8-inch External adapter can conveniently either stand on its edge or lie on its side; the provided par-

allel cable gives you some flexibility in placing the unit on the desk. The front of the adapter sports three large LED diagnostic indicators that monitor adapter speed, ring insertion, and network traffic. The External adapter's diagnostic capabilities are the same as the Pocket adapter's.

Each unit comes with a two-year parts-and-labor warranty. For a one-time fee of \$199, Xircom supplies a Customer Assistance Program (CAP) that extends the warranty to five years and offers free software updates to the user. In addition, the CAP provides for upgrades from any Xircom adapter model to any other model; the user receives a credit equal to 50 percent of the list price of the unit traded in. This will be of interest to companies that change network architectures, switching among Ethernet, Token-Ring, and ARCnet.

Xircom has also released the \$745 Pocket 3270 Adapter, which we did not review for this article. Once again Xircom is the first with a portable solution, this time for those who need to access a

mainframe from a laptop.

Both Xircom Token-Ring adapters we examined proved reliable performers, and they are so easy to install that a novice could have them up and running in minutes.

While you can't go wrong with the Xircom Pocket Token Ring Adapter, Accton's RingPocket has greater flexibility and speed, as well as a lower price, which make it a better choice when portability is a must.

For the desktop, the Xircom External Token Ring Adapter makes a good docking station if your laptop happens to be your primary computer. It's also an option for connecting a desktop PC that has no slots left for an internal adapter card. The nominal price difference between this and the Pocket adapter makes the External adapter a better value, and it is still small enough for portable use if you don't mind carrying an extra pound or so around. ■

Frank J. Derfler, Jr., is workgroup systems editor of PC Magazine. Joe Salemi is the author of PC Magazine's Advisor column, and a sysop on ZiffNet.

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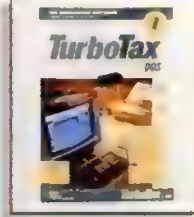
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Joe Salemi

Advisor

CONVENTIONAL, EXTENDED, AND EXPANDED MEMORY

I'm writing to find out if you could help me understand the differences between conventional, extended, and expanded memory. I've read much material on these topics and it has only made me more confused. I've worked with *QEMM* and *QRAM* but I really don't know what I'm doing; though I have a lot of programming experience, this is a gray area for me.

Robert Day
Long Beach, California

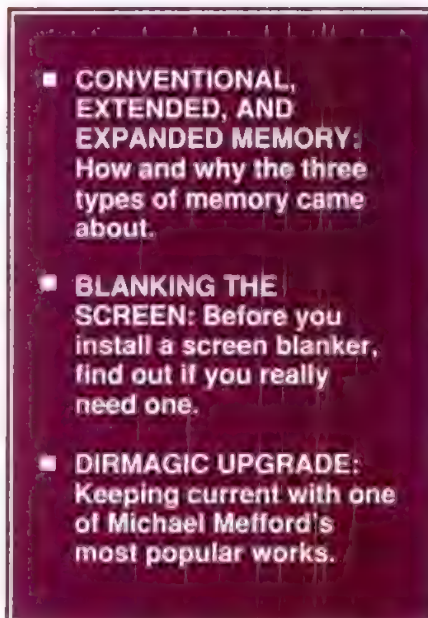


Your question is a common one, so you're not alone in being confused by this issue. Simply stated, conventional memory is the first 1MB of RAM—this was a limit imposed by the Intel 8088 processor that IBM used in the original PCs.

In practice, the upper 384K was reserved for read-only memory and system services, such as the BIOS and video memory, so conventional memory is normally used to describe the 640K that unmodified DOS works with. Every bit of the upper 384K of RAM is not used, however, so 386 memory managers (and now DOS 5.0) can access the upper memory blocks (UMBs), which are the addresses above 640K that are empty. UMBs can be used to store device drivers and TSRs, freeing up a few kilobytes in the lower 640K.

The introduction of the IBM PC AT with its 80286 CPU brought about the concept of extended memory, which is the directly addressable memory above 1MB. This memory can be used by the 80286 processor when it's operating in protected mode; when the 286 is in real mode (emulating an 8088), it's limited to conventional memory. The most common way of using extended memory from DOS programs is to create a RAM disk.

Expanded memory (or EMS) is bank-switched memory, and can be used by all Intel processors from 8088s to 80486s. It's a technique for loading large files that



uses a trick called bank-switching: A bank of memory is moved back and forth between conventional memory and expanded memory.

A 64K page frame is created (usually in the unused RAM addresses between 640K and 1MB). It holds the data and code switched in and out of the EMS memory area when needed. On 8088 and 286 PCs, the expanded memory is usually provided by a hardware board (such as Intel's Above Board). The 386 and 486 chips have built-in memory management, and they can use EMS techniques when a memory manager such as Quarterdeck's *QEMM* is installed.

Some vendors of 286 chip sets (the support chips for the CPU) have also included hardware support for the conversion of extended memory to EMS, and products like Qualitas's *Move 'Em* let you use both extended and expanded memory on these systems.

Protected-mode operating systems such as OS/2 and Unix don't even bother to distinguish between conventional and extended memory; it's all just RAM to these systems.

You can get more details on these different types of memory in the May 29, 1990, Lab Notes ("How to Get the Most From Your System's High DOS Memory" by contributing editor Barry Simon). And sometime in the early part of next year we'll be publishing a review of 386 memory managers.

BLANKING THE SCREEN

If you are going to be away from your computer for a considerable period of time—let's say an hour—is it best (from the point of view of reducing wear and tear on the machine) to turn the whole system off, turn off only the monitor, use a screen blanker, or use a screen saver that puts a moving image on the screen? Does it really matter?

If it does matter, and the approved solution depends on the time period that the machine is to be left unattended, what are the guidelines for a shorter period and a longer period?

W. A. Russell
Annandale, Virginia



Raising this subject on any of the on-line services is a surefire way to start a raging controversy.

The general consensus I've seen is that turning off the PC itself does more harm than good, because of the initial power surge; however, turning off the monitor when you're away from it for an extended period saves wear and tear on the video tube. The question is, how long is an "extended period?"

Again, opinions vary widely on this; overnight is definitely an extended period, but I'd say that less than an hour or two isn't. Under two hours, a screen blanker or saver would do the job fine. The original idea behind blanking or saving the screen goes back to the days when long-persistence phosphorous monochrome monitors were more common—leaving the same image on the screen for extended periods could cause a "ghost" of that image to be burned into

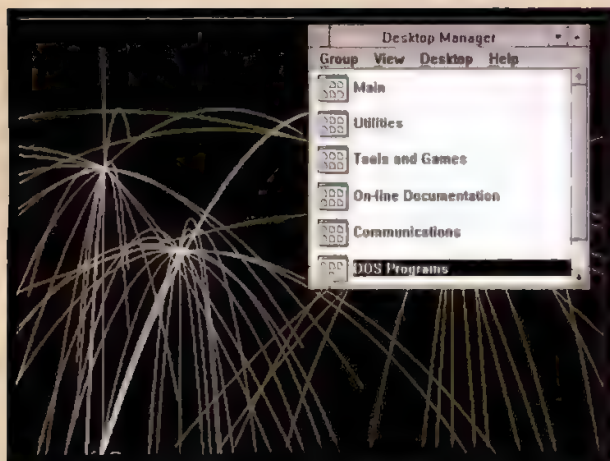


Figure 1: An animated fireworks display is one of the many OS/2 desktop backgrounds provided by DESKPIC.

the phosphorous, eventually ruining the screen.

Color CGA monitors had less of a problem with burn-in, and as video standards got better, the danger of burn-in got lower, to the point where it's a negligible problem on VGA systems.

On the other hand, there is a security benefit provided by blanking the screen, even on a VGA system; automatic or on-demand screen blanking protects private or confidential data from being read off your screen.

There are a number of TSR DOS screen blankers in Library 16/Gen Utils of our PC MagNet Utilities/Tips Forum, including ScreenBlank (SCRBLK.ARC) and VGABlack (VGABLA.ZIP). Details on how to join PC MagNet can be found on page 10 of this issue. My personal favorite is BURNOUT (BRNOUT.ARC), a free utility by Chris Dunford; the idle time before blanking can be adjusted without having to unload and reload the device driver, and it supports a user-configurable hotkey to blank the screen immediately.

The next step up is the screen blankers that provide some system security password protection. Be aware though, that this security isn't foolproof—someone can get around it by rebooting the system. CONCEAL is a *PC Magazine* utility (Utilities, September 11, 1990) that will either blank the screen, or place a graphic of a bouncing ball on it. A password that would have to be entered before the screen returns to normal can be in-

cluded on the command line. CONCEAL is available in Library 2/PC Mag Utils of the Utilities/Tips forum as CONCEA.ARC. Also in Library 16 is SCSAVER (SCSV44.ZIP), a \$20 shareware program from Tom R. Donnelly (P.O. Box 3856, San Dimas, CA 91773) that can lock the system from unauthorized entry, and can also be reconfigured on the fly.

If you want a screen blanker that just puts moving graphics on the screen, you can't beat DAZZLE (DAZZLE.ZIP). While not a TSR, DAZZLE fills the screen with an ever-changing kaleidoscope that's almost hypnotic to watch; users can vary the speed, patterns, and colors to suit their individual tastes. DAZZLE costs \$15 as shareware, and is available either in Library 16, or directly from the authors (J.R. Shiflett's Midnight Visions Workshop, c/o MicroTronics, 503 Shenandoah Dr., Spring, TX 77381).

DOS-based screen blankers don't work with Windows 3.0; however, there are a number of Windows' utilities that blank out the screen with a moving pattern. Both Microsoft's *Entertainment Pack for Windows* (\$40) and Symantec Corp.'s *The Norton Desktop for Windows* (\$149) include screen blankers with their many utilities; the SLEEP program that's part of *The Norton Desktop* also has the ability to password-protect the system. If you only want a Windows screen blanker, you can use the shareware program MAGIC, available in Library 10/Windows of the Utilities/Tips Forum or direct from the authors (Dynamic Information Systems,

Unit 4, 3530 15th St. SW, Calgary, Alberta, Canada T2T 4A3; 403-243-0296). MAGIC's registration fee is \$25.

Finally, for OS/2 users there's DESKPIC, a public domain program that blanks the screen with any of a number of different animated screen savers (Figure 1). It can also replace the static desktop background with an animated picture. DESKPIC is available as DESKPIC.ZIP in Library 2/Environments of the PC MagNet Programming Forum. IBM's OS/2 2.0 also includes a screen blanker called LOCKUP, which replaces the desktop with a bitmap picture, and can also password-protect the system.

DIRMAGIC UPGRADE

Help! I have been using your *DirMagic* directory management utility since I got my first computer in 1988. I recently fell victim to marketing hype and upgraded from PC-DOS 3.3 to PC-DOS 5.0. There have been several unpleasant surprises resulting from the upgrade, but none quite so profound as the discovery that *DirMagic* doesn't work with PC-DOS 5.0.

Is there an upgrade available that will let me use *DirMagic* with DOS 5.0? If so, how can I obtain it?

Harwood Loomis
Woodbridge, Connecticut



Starting with DOS 4.0, the FAT (file allocation table) changed to allow hard disk partitions greater than 32MB; this "broke" *DirMagic*. Information on getting an upgrade is one of the most common requests in both my mail and on PC MagNet.

The version of *DirMagic* that you have was initially offered as a bonus utility to new subscribers to *PC/Computing*, and the copyright to the program was retained by Michael Mefford, the author. Upgrades to the latest version (which works with DOS 4.x and 5.0) are available directly from him; send a self-addressed stamped floppy disk mailer, blank floppy disk, and \$15 to Michael J. Mefford, P.O. Box 351, Gleneden Beach, OR 97388.

ASK THE ADVISOR

Send your questions to PC Advisor, One Park Avenue, New York, NY 10016, MCI mailbox PC MAGAZINE, or upload them to PC MagNet (see the instructions for joining on page 10 of this issue). We regret that we're unable to acknowledge submissions or answer questions individually. ■

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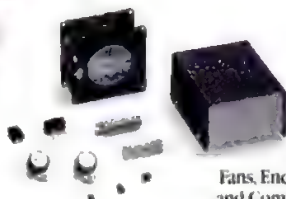
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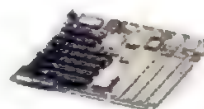
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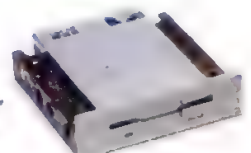
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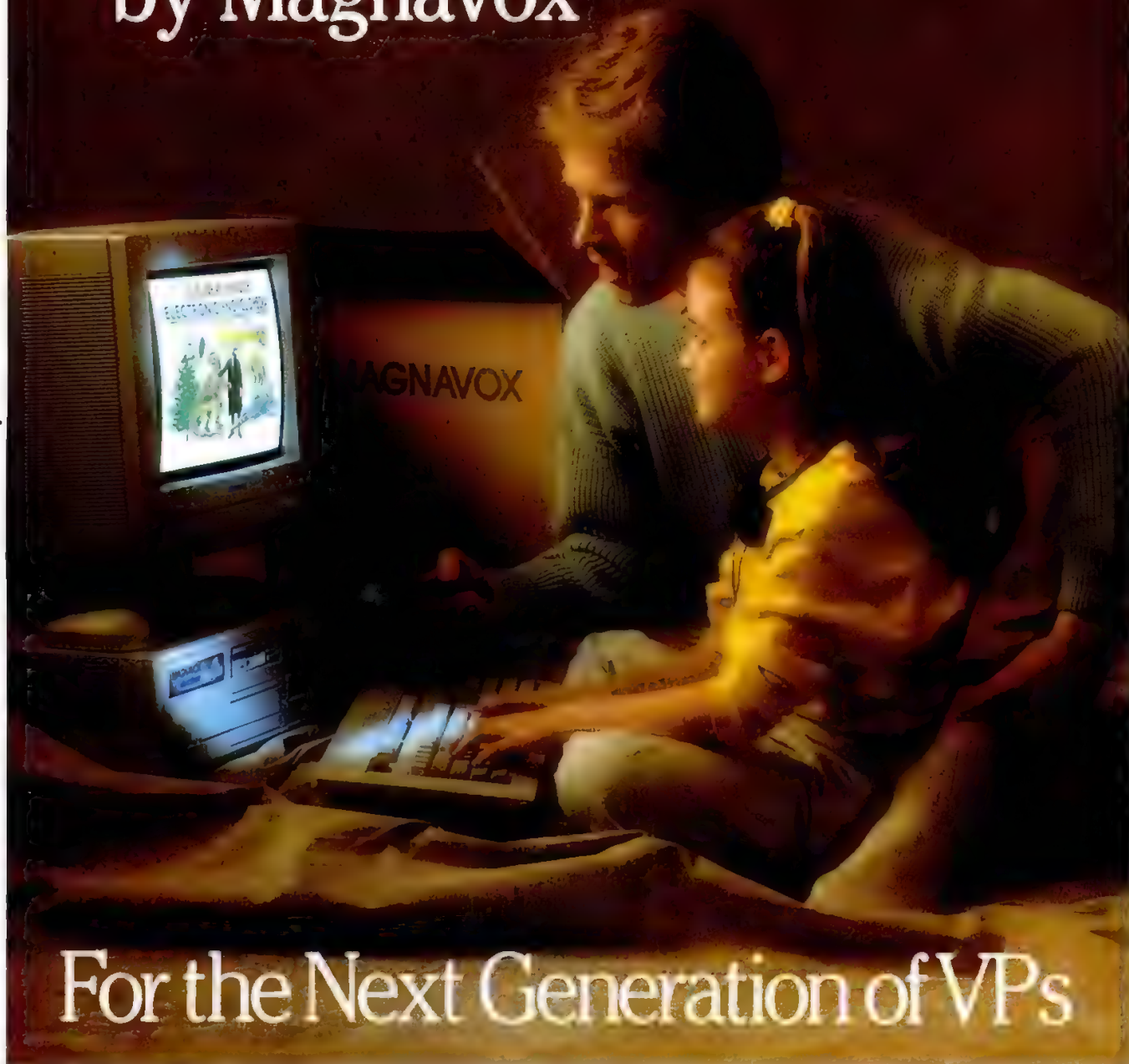
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FANCY PROMPTS

For as long as I can remember, I've had the statement

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in my AUTOEXEC.BAT file. When I'm at the DOS command line, this causes a banner to display at the top of the screen showing the current drive and directory along with the date and time in inverse video. (If you try this yourself, type the number of spaces indicated in the angle brackets—not the brackets or values they hold.) I know this is somehow tied to the ANSI.SYS driver loaded in my CONFIG.SYS, but beyond that, I'm clueless. Can you explain exactly what's going on?

Larry Rizzo

Santa Monica, California

PC You're using the standard PROMPT command's capabilities, but with a twist: Its parameter string contains embedded escape sequences (groupings of characters preceded by \$e, which PROMPT translates into an escape code). ANSI.SYS interprets these escape sequences as screen control directives. You're also using some of the more esoteric metasympols that PROMPT itself understands.

To illustrate what's happening, try this experiment. At the command prompt, enter the line:

```
PROMPT $t$g
```

The DOS prompt will change to display the current time (including hundredths of a second) followed by a greater-than sign. The PROMPT command—with no help at all from ANSI.SYS—understands \$t to mean that you want the current time displayed, and that \$g is the metasympol for a greater-than sign. Consequently, PROMPT \$t\$g displays the current time

■ **FANCY PROMPTS:**
How to put some lesser-known prompt commands and ANSI.SYS to work to enhance your command line.

followed by a greater-than symbol. Now type the following line:

```
PROMPT $t$h$h$h$g
```

This command is similar to the last, but with the metasympol for backspace (\$h) inserted three times between the \$t and \$g. What does this do? The three rightmost digits in the time are erased when the cursor is backspaced, eliminating the hundredths of a second position. You can expand on this by using additional metasympols from Figure 1, which lists all those that PROMPT understands. Some may already be familiar to you. For example, you may already put the command

```
PROMPT $p$g
```

in your AUTOEXEC.BAT file in order to display the current drive and directory to the left of the cursor at every command prompt.

One of the more interesting metasympols from Figure 1 is \$_, which can be used to create multiline prompts. For example, the command

```
PROMPT $d$_$t$_$p$g
```

displays the date on the first line, time on the second, and the current drive and directory on the third.

The next part of our experiment requires ANSI.SYS. If your CONFIG.SYS doesn't already contain a statement similar to DEVICE=ANSI.SYS (or the equivalent

using DEVICEHIGH), add one with your favorite text editor and reboot so the change will take effect. Now, at the command line type

```
PROMPT $e[1;37;41m$P$g$e[0;37;40m
```

The DOS prompt will show the current drive and directory, but in intense white on red, not the standard white on black (provided you have a color system, of course).

Here's how it works. This PROMPT string actually contains three separate commands. The first, \$e[1;37;41m, tells ANSI.SYS to change the text output color to intense white on red. The second, \$P\$g, is the PROMPT command to display the current drive and directory. The third, \$e[0;37;40m, causes ANSI.SYS to restore unintensified white on black. Since the color change to white on red occurs before execution of \$P\$g, the command

PROMPT COMMAND METASYMBOLS	
Metasympol	Description
\$b	Piping symbol (!)
\$d	Current date (for example, Fri 08-02-1991)
\$e	Escape character
\$g	Output redirection symbol (>)
\$h	Backspace
\$I	Input redirection symbol (<)
\$n	Current drive
\$p	Current drive and pathname
\$q	Equal sign (=)
\$t	Current time (for example, 12:36:41.68)
\$v	DOS version number
\$	Dollar sign (\$)
\$_	Line terminator

Figure 1: When used as parameters following the PROMPT command, the codes listed on the left will produce the effects shown to the right.

ANSI.SYS ESCAPE SEQUENCES FOR SCREEN CONTROL

Escape sequence	Description
ESC[H	Move the cursor to row 1, column 1.
ESC[xx;yyH	Move the cursor to row xx, column yy. If either xx or yy is omitted, the default is 1.
ESC[xx;yyf	Move the cursor to row xx, column yy (same as ESC[xx;yyH).
ESC[xxA	Move the cursor up xx rows. If xx is omitted, the default is 1.
ESC[xxB	Move the cursor down xx rows. If xx is omitted, the default is 1.
ESC[xxC	Move the cursor forward (right) xx columns. If xx is omitted, the default is 1.
ESC[xxD	Move the cursor backward (left) xx columns. If xx is omitted, the default is 1.
ESC[s	Save the current cursor position.
ESC[u	Restore the last cursor position saved with ESC[s.
ESC[2J	Clear the screen and move the cursor to row 1, column 1.
ESC[K	Clear all characters from the cursor to the end of the line.
ESC[xx;...xxm	Set text colors and attributes. Valid values for xx are
0	Turn all video attributes (bold, underscore, blink, reverse video, and concealed) off.
1	Make foreground colors bold.
4	Turn underscore on.
5	Turn blink on.
7	Reverse video.
8	Turn concealed attribute on.
30	Set foreground color to black.
31	Set foreground color to red.
32	Set foreground color to green.
33	Set foreground color to yellow.
34	Set foreground color to blue.
35	Set foreground color to magenta.
36	Set foreground color to cyan.
37	Set foreground color to white.
40	Set background color to black.
41	Set background color to red.
42	Set background color to green.
43	Set background color to yellow.
44	Set background color to blue.
45	Set background color to magenta.
46	Set background color to cyan.
47	Set background color to white.

Figure 2: Use these ANSI.SYS codes to customize the DOS command line by inserting them as parameters to PROMPT.

prompt displays as white on red. Then, because the colors are changed back to white on black, text typed to the right of the prompt appears in the default screen colors.

This represents only a small sample of the commands ANSI.SYS understands. Your DOS manual lists them all, and Figure 2 contains a summary of those you can use to customize command prompts. With this table you can figure out exactly how the command Mr. Rizzo listed in his question works.

The first part, \$e[s, saves the current cursor position, then \$e[24A places the cursor at the top of the screen by moving it up 24 rows. (This technique works fine on 25-line screens but it's possible to

display a greater number of lines with EGA and VGA video adapters; we'll present a more foolproof method in a moment.) \$e[1D moves the cursor left one column and \$e[K erases everything from there to the end of the line. \$e[7m turns reverse video on and \$p displays the current drive and directory at the new cursor position in the upper-left corner of the screen. <20>\$t\$h\$h\$h spaces over 20 columns, prints the current time, then erases the decimal and hundredths digits from the end (again, make sure that you don't type the "<20>"; type 20 spaces instead). <25>\$d spaces over another 25 times and prints today's date. After this, <5>\$e[m spaces to the end of the line and turns reverse video off. Finally, \$e[u re-

stores the cursor position saved earlier with \$e[s and \$n\$g displays the current drive followed by a greater-than sign. Although this command seems complex at first, when it's broken down, you can see that it's really fairly simple.

I've modified Mr. Rizzo's PROMPT string slightly to make it work on screens displaying any number of lines and to eliminate all the spaces between commands. To try it, type the following on the command line or add it (as a single line) to your AUTOEXEC.BAT file, then reboot:

```
PROMPT $e[s$e[H$e[1;33;44m$e[K
$e[1C$p$e[1;36H$t$h$h$h$e[1;66H$d
$e[0;37;40m$e[uCommand$g
```

Another piece-by-piece analysis reveals how this PROMPT string works, too. \$e[s saves the cursor position, then \$e[H moves the cursor to the upper-left corner of the screen, no matter how many rows show. \$e[1;33;44m changes the text colors to yellow on blue, \$e[K clears everything to the end of the line (using the currently selected color) and \$e[1C moves the cursor one column to the right. Next, \$p displays the current drive and directory, \$e[1;36H moves the cursor to row 0, column 36; \$t\$h\$h\$h displays the current time, and \$e[1;66H moves the cursor to row 0, column 66. At this position, \$d displays the date, \$e[0;37;40m restores the text colors to white on black, and then \$e[u moves the cursor back to the command line. Completing the process, Command\$g displays "Command" followed by a greater-than sign to serve as the command prompt. The result is a blue title bar at the top of the screen showing the current drive, directory, time, and date.

With a little work and a healthy dose of imagination, you can come up with some pretty inventive command prompts of your own.

ASK THE TUTOR

The Tutor solves practical problems and explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. Send your question to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 10 for instructions). We regret that we can't acknowledge submissions or answer questions individually. ■

by
Neil J. Rubenking

User-to-User

CHANGING THE CLS COLORS

Sometimes application programs alter DOS's "clear screen" colors, or you may just prefer colors other than the normal gray on black. In any case, you can slightly modify the code in COMMAND.COM's CLS function. That way, at any DOS prompt you can just type CLS to get, for instance, a bright white on blue screen. I've stopped patching the border because it requires adding JMP's and tacking on code. At present, this patch (for DOS 5.0) will therefore leave the black border. If you're using EGA or VGA, the border is tiny anyway, but my old CGA screen used to have "wall-to-wall" colors.

I suggest using *The Norton Utilities* for this modification since it's the easiest. Search for the following sequence of (hexadecimal) bytes:

```
8B C8 B4 06 B7 07 32 DB CD 10
```

Norton will stop at the point that the sequence *starts*, but that's not the byte you need to change. You want to change the sixth byte from 07 to 1F, thus changing the screen colors from gray-on-black to bright white-on-blue.

If you don't have *Norton Utilities* you can use DEBUG. That command is:

```
8 0100 FFFF 8B C8 B4 06 B7 07 32
DB CD 10
```

DEBUG too will stop at the start of the sequence. Use the unassemble command, and reassemble the instruction from MOV BH, 07 to MOV BH, 1F. Or use the Enter command to replace memory contents from 07 to 1F.

Anthony M. Parsons, Jr.
Berwyn, Illinois



Even five or six years ago, people were writing to *User-to-User* with COMMAND.COM patches that could be used to change the default screen colors. At first the instructions were specific to one DOS version, but in the March

■ **CHANGING THE CLS COLORS:** Here's how to change the default screen colors in DOS 5.0.

■ **TESTING FOR WILDCARDS:** Here's a method for checking whether a batch file parameter is a unique filename or a wildcard.

■ **DOS GETS BETTER:** DOSKEY macros and an enhanced FORMAT command let you get your work done quicker under DOS 5.0.

13, 1990, issue, a reader demonstrated how to use DEBUG to search for the string of bytes that encodes the CLS color-setting command.

Unfortunately, DOS 5.0 doesn't use the exact same instructions in the CLS command, so the sequence of bytes used for DOS 3.3 is no longer found in COMMAND.COM. The string supplied by Mr. Parsons *does* work, both for DOS 5.0 and DOS 4.0.

As long as you don't load ANSI.SYS, DOS writes characters to the screen in whatever color was previously at that screen location. Hence a color-patched CLS will seem to color all your DOS commands. But if ANSI.SYS is loaded, DOS output gets written in the current color, which by default is gray-on-black. To use ANSI.SYS with a patched COMMAND.COM, you need to synchronize the ANSI color with the CLS color. The easiest way to do that is to build a color-setting ANSI command into your prompt. For example, adding the string \$e[37;44;1m to the beginning of your prompt will set the ANSI color to bright

white on blue.

As always, exercise care when patching COMMAND.COM. Be sure you have a bootable disk with an unpatched copy of COMMAND.COM on hand, in case you make a blunder. Here are the specific steps to apply the color patch to COMMAND.COM:

- Enter the command

```
DEBUG COMMAND.COM
```

- At the DEBUG dash prompt, issue the search command:

```
5 0100 FFFF 8B C8 B4 06 B7 07 32
DB CD 10
```

- You should see a two-part address like 2693:4364. If you don't, double-check the list of bytes.

- Issue a U (for Unassemble) command using the second part of the address, for example U 4364.

- The third instruction in the unassembly should be MOV BH, 07. At the beginning of the line is a two-part address like 2693:4368.

- Use the A command to Assemble a new instruction at that address like this: A 4368. Type MOV BH, 1F and hit Enter twice.

- If all has gone well so far, enter W to Write your changes to disk.

- Enter Q to Quit DEBUG.

If you want to change to another color at some later date, either start with a fresh unpatched copy of COMMAND.COM or substitute your current color number for the 07 in the search string.

TESTING FOR WILDCARDS

It's often useful to test whether a parameter passed to a batch program is an unambiguous filename or a wildcard. A classic example was discussed in the July 1989 issue of *PC Magazine*: A previously published version of MOVE.BAT worked as intended when passed an unambiguous filename, but unintentionally deleted

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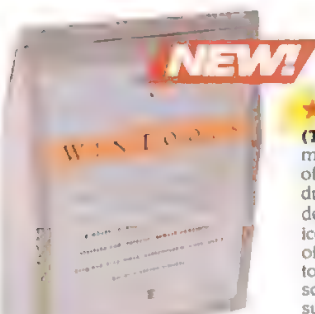
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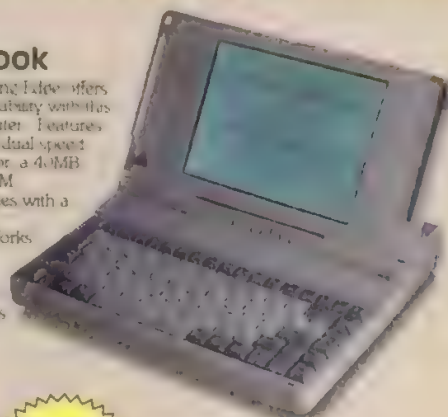
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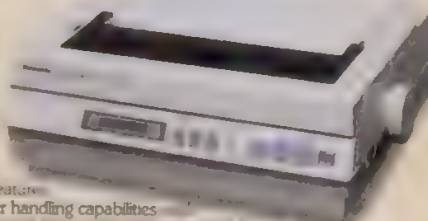
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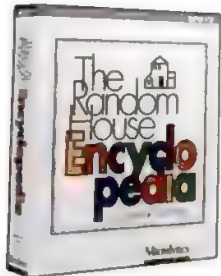
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I define it with the command

DOSKEY MACS=DOSKEY /MACROS

Now I just type MACS to see all my macros on-screen.

I load all the macros into DOSKEY from my AUTOEXEC.BAT file. If I change the macros, I just run MACS, redirecting its output to a file. By inserting "DOSKEY" at the beginning of each line in this file, I get a complete set of lines to update the macro section of my AUTOEXEC.BAT.

My other essential macro is for quick formatting. One cool thing about DOSKEY is the fact that you can break the 8-character limit for a command name! So here it is:

DOSKEY QUICKFORMAT=FORMAT A: /Q
/U /F:720 /V:""

This just about does the trick except for the final prompt that asks if you want to format another disk. To get past this, you can create a file and redirect its contents to the FORMAT program, like so:

DOSKEY QFA720=FORMAT A: /Q /U
/F:720 \$L C:\BATCH\FORMAT.TXT

The \$L stands for the input redirection symbol <. FORMAT.TXT contains a blank line, a line with the volume label (possibly blank), and a line that just contains the letter N.

Cliff Garrett
Kirkland, Washington

You'll find a detailed description of DOSKEY's abilities in the September 10, 1991, Tutor column. DOSKEY takes care of most of the needs previously addressed by command line enhancers like CED and *PC Magazine's* ALIAS. Combined with other DOS 5.0 features, DOSKEY macros replace even more utilities. For example, here's a replacement for WHEREIS.COM, a utility that finds files anywhere on the current disk that match a specified template:

DOSKEY WHEREIS=DIR \\$/1 /B/S

That's it! Like %1 in a batch file, \$1 is a DOSKEY macro's first command line parameter. The new /B switch tells DIR to display the files in "bare" format, showing nothing but the full pathname. And the new /S switch tells it to look in all subdirectories as well.

WCTEST.BAT

COMPLETE LISTING

```
@ECHO OFF
REM --- WCTEST.BAT
REM --- Tests for wildcard parameter.
IF NOT '%1'=='' GOTO Param
    ECHO %1 requires a command-line parameter.
    GOTO End

:Param
IF EXIST %1 GOTO Exist
    ECHO No files match "%1".

:Exist
SET FF=
FOR %f IN (%1) DO SET FF=%f
IF '%FF'=='%1' GOTO Unique
    ECHO "%1" is a wildcard. Aborting.
    GOTO End

:Unique
ECHO Simulating operation on single file "%1".
:End
SET FF=
```

Figure 1: This batch file demonstrates a method for testing whether a command line parameter is a wildcard filename.

many files if passed a wildcard by an unknowing user.

Figure 1 shows a method for ensuring that command line parameters to batch files are not wildcards.

Jeff Jansen
Portland, Oregon



You can use the FOR loop to execute a particular command on a list of items. For example the command

```
FOR %v IN (1 2 3 4 5) DO MD
CHAPTER%v
```

will create five directories (CHAPTER1 through CHAPTER5). But if any of the items in the FOR list contain the * or ? characters, DOS will replace that item with *all* of the filenames in the current directory that match. The command

```
FOR %f IN (*.*) DO IF EXIST B:\%f
COPY %f B:
```

goes through all the files in the current directory and checks whether a file with the same name exists on the B: drive. If so, it copies the file from the current directory to B:. So FOR has two different modes of operation, depending on whether the items in the FOR list contain wildcards or not.

WCTEST.BAT takes advantage of the FOR command's behavior to determine whether a given parameter is a unique

filename or a wildcard filename. It also reports whether or not a matching filename exists in the current directory. Just after the label :Exist, the batch file clears the environment variable FF. Then, for each file that matches that command line parameter, it sets variable FF to the name of the matching file. If the parameter was a wildcard filename and at least one matching file exists, FF is set to the name of the last matching file. If the parameter was a wildcard with no matching files, FF remains empty. Only if the parameter was an unambiguous filename does FF get set to the exact value of that parameter. Hence the test IF '%FF'=='%1' is true only for an unambiguous filename.

DOS GETS BETTER

DOS 5.0 adds fantastic properties to commands that used to be a severe pain, such as FORMAT. Now unformat information is retained, and there's unconditional formatting, and (on some drives) media sensing. The only problem is that with all the new features, it can take *longer* to get a simple format done! Luckily you can use DOS 5.0's new DOSKEY utility to solve this problem easily.

DOSKEY is a TSR (terminate and stay resident) program that enhances the command line by providing command history and macro-making facilities. I've developed a library of macros that make it essential. I don't even have to type DOSKEY /MACROS to see all of my macros: I have a macro called MACS to do it for me.

FORMAT.COM acquires some new and noteworthy features in DOS 5.0. In previous DOS versions, formatting a floppy disk always involved both a low-level and a high-level format. The low-level format isn't strictly necessary after a disk has been formatted once, so various utilities arose to let you format floppies quickly by doing only a high-level format. In DOS 5.0, a /Q switch on the command line tells FORMAT to speed things up by skipping the low-level format.

DOS 5.0's FORMAT also automatically stores information that will let you UNFORMAT a disk. If you suddenly realize you're formatting a disk with valuable data on it, don't despair! Let FORMAT finish its work, then immediately run the new UNFORMAT command. Even if you've written new data to the formatted disk, UNFORMAT can probably recover any files whose data areas weren't overwritten by the new information.

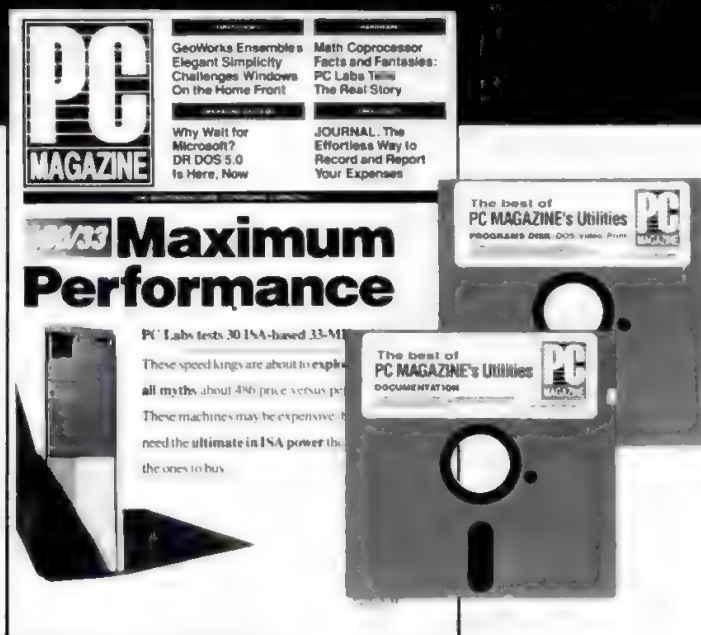
Sometimes you *know* the data on a given disk is worthless; in that case you can use the /U switch, for Unconditional format. In this mode, FORMAT does not save any unformat information. For the very quickest formatting, use both the /Q and /U switches, as shown in the examples above.

The September 25, 1990, User-to-User column pointed out three undocumented FORMAT switches introduced with DOS 4.0: /SELECT, /BACKUP, and /AUTO-TEST. Adding these to the command line caused FORMAT to skip one or more of its prompts, thus speeding the formatting process. In DOS 5.0, the switches are still present and still not documented, but they're incompatible with the /Q switch. Also, adding /SELECT seems to cause problems with the target disk's format. I don't recommend using the undocumented switches under DOS 5.0.

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Scientific model		
Recalc all	3.7	10.0
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Windows

UNRECOVERABLE APPLICATION ERRORS

Although I only see it occasionally, the dreaded "Unrecoverable Application Error" (UAE) haunts my Windows 3.0 environment, as does the even more alarming "Violated System Integrity" error. These messages rarely cause any serious damage, forcing me at most to rekey a few lines. Today, however, I got the UAE message just as I was saving a database definition in Spinnaker's *PFS:Window-Works*. It had taken me 22 minutes to create that definition.

I run Windows 3.0 and MS-DOS 5.0 on my 386SX, which has 2MB of memory. I run Windows in Standard mode, because 386 Enhanced mode causes my machine to crash more often. Besides *Window-Works*, the applications I run under Windows are Microsoft's *Word for Windows* and some shareware applications.

I consider Windows an excellent DOS extension, and I use it all the time. But if I encounter many more of these UAEs, I may have to find another GUI environment for myself and my customers.

Can you explain what is happening when a UAE or Violated System Integrity error occurs? Why does the former just kick you out of the current application while the latter makes you shut everything down and reboot? Couldn't Windows abort an application in a more benign way, so you don't entirely lose what you're working on?

Joe Caverly
St. Thomas, Ontario
Canada



One of the biggest criticisms of DOS is that it runs in the *unprotected* real mode of the Intel 80x86 chip, exposing the operating system and applications to all kinds of invalid memory-addressing errors that may not be caught until your machine locks up. To prevent such lock-ups, Windows puts the 80286 or better processor into protected mode so that DOS, Windows, and any

■ **UNRECOVERABLE APPLICATION ERRORS:**
Why you get UAEs and what you can do to prevent them.

applications you are using are protected from each other at the hardware level. If one task fails, the entire system does not go down (at least in theory).

Everyone agrees that the protected mode of the Intel chip is preferable to its real mode; in fact, Microsoft will not offer Windows Real mode as a feature in Windows 3.1. (For more information on Intel's and Windows' modes, see Lab Notes in the June 11, 1991 issue.)

UAEs, which occur only in Standard and 386 Enhanced modes, indicate that a Windows application has caused a protection violation. That is, an application has attempted to write to a memory space for which it does not have permission, or tried to execute an instruction that it is not permitted to execute.

For example, if a procedure that executes the Load Task Register (LTR) instruction is not running with a current privilege level (CPL) of 0 (the most privileged of the 80x86's four levels), a general protection (GP) fault occurs. Only the operating system is allowed to execute that instruction.

The UAE indicates that Windows or an application tried to do something that would have damaged the memory space of another task if it weren't in protected mode. If the "bad" application is eliminated immediately, it can cause no further damage; if it continues to run, it might actually cause memory damage.

I agree that Microsoft should have devised a more elegant method of handling UAEs. In Windows 3.0, you have no choice how the error is handled: Windows just gets rid of the application.

Fortunately, Windows 3.1 will handle UAEs in a much friendlier fashion, giving you a few choices when you encounter one. You'll get to decide if the application should continue.

Since you'll still get UAEs (although fewer of them) in Windows 3.1, I'll describe a side effect of UAEs and the most frequent reasons why they occur.

If your application aborts with a UAE, Windows 3.0 will be unstable until you exit, reboot, and restart Windows. After a UAE, certain sections of memory may be corrupted—specifically, the local data spaces of the KERNEL, USER, and GDI components of Windows. They will probably have allocated resources that can no longer be accessed, thus reducing the amount of Free System Resources (FSRs).

This could cause other applications to receive the same UAE, even though they did not originally cause the problem. That's why it's important that you remember to restart Windows.

The following are the most frequent causes of UAEs:

- *You're running an incorrect version of DOS.* Make sure you have the proper DOS version for your specific hardware. Original equipment manufacturer (OEM) versions of DOS, such as IBM PC-DOS or Compaq DOS, should be used only on their respective OEM hardware platforms. On other machines, according to Microsoft, you can determine the proper DOS version using the following rule: If the manufacturer offers an OEM version of DOS, use it. If not, use generic MS-DOS. Versions 3.3 and 5.0 are preferable to DOS 4.01 and other versions.
- *You selected an incorrect machine type and/or network when running the Windows Setup program.* Some machines and networks require you to make a specific selection in order to override Setup's defaults. If you didn't explicitly choose your machine or network during Setup, exit Windows and run the DOS version of Setup from your Windows directory.
- *Your CONFIG.SYS and/or AUTO-*



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EXEC.BAT files contain incompatible TSR programs or unsupported network drivers. Temporarily remove all suspect drivers and TSRs. If this eliminates the UAE problems, replace the removed lines one by one. When the problem reappears, you'll know which driver or program is the culprit.

■ *You're running an application designed for an earlier version of Windows in Windows 3.x's Standard or 386 Enhanced mode.* If an application hasn't been properly upgraded to function under Windows 3.x's protected modes, it will probably cause UAEs. This includes "marked" applications.

When you run an application designed for Windows 2.00, 2.03, 2.10, or 2.11, Windows displays a dialog box suggesting you run the application under Real mode. This doesn't mean the application will perform bug-free in Real mode; it just means that the protected-mode hardware won't catch any bugs.

■ *FSRs are low.* Check the Help About command in Program Manager or File Manager often in order to monitor your FSRs, or download my FSR-monitoring utility (WINFSR), which is described in the November 12, 1991, Windows column. Once FSRs get below 10 to 20 percent, the Windows environment becomes unstable because many applications don't handle scarce resources as well. Windows 3.1 will alleviate this problem by managing FSRs better and by checking programs more thoroughly as they execute. Nevertheless, it's still a good idea to keep an eye on your FSRs.

■ *You may have a page-mapping conflict (applicable only to 386 Enhanced mode).* Test the problem under Standard mode by running Windows with the /s argument. If there's no problem in Standard mode, it may be a page-mapping conflict in the adapter-segment area of memory (between paragraph addresses A000h and EFFFh). Edit your SYSTEM.INI file, and insert the following line in the [386Enh] section:

EMMExclude=A000-EFFF

This will exclude the entire adapter segment from page mapping. If this solves the problem, you may want to determine the position of all hardware adapters in the adapter segment and exclude them specifically rather than excluding the entire region. (You can use multiple EMMExclude lines if needed.)

If you're using a computer with an Industry Standard Architecture (ISA) bus, consult your adapter documentation or manufacturer's technical support service for information on memory locations used; if your computer has a Micro Channel architecture (MCA) bus (like IBM PS/2s do), you can determine the adapter location by booting with the machine's Reference Disk.

■ *You're accessing a file that is cross-linked with another file. This may cause a UAE or even a "Violated System Integrity" error, as do lost clusters (or lost allocation units).* The DOS CHKDSK utility can identify these problems and, if you use the /F parameter, correct them. (Be sure to exit Windows completely before running CHKDSK; running it from within Windows with /F will corrupt your hard disk and actually lead to UAEs.)

CHKDSK checks the disk's directory structure and file allocation table (FAT) for inconsistencies such as defective disk sectors in the FAT, invalid cluster numbers in the FAT, lost clusters (marked as "in use" but not assigned to a file), cross-linking of files on the same cluster (more than one file assigned to the same cluster), damage to an entire directory that makes its files inaccessible, damage to a portion of the directory that makes it impossible to check one or more paths, and bad file attributes in directory entries.

Because there's no way for Windows to clean up these kinds of problems and continue (as it can when it generates a UAE, which involves memory and not disk storage), problems at this level cause the "Violated System Integrity" error and force you to reboot.

If your UAE problems can't be traced to any of these standard items, they probably lie with the application that is running when the UAE occurs.

OPENING WINDOWS

Share your Windows experiences with Fran Finnegan; we'll pay you \$50 for any tip we print. Mail your contribution on-disk, with a printout, to Windows, PC Magazine, One Park Avenue, New York, NY 10016, or e-mail it (re: PC Magazine) to: PC MagNet: 76244,145; MCI Mail: Fran Finnegan; BIX: franfinnegan; GEnie: finnegan; Internet: finnegan@well.sf.ca.us. We regret that we're unable to acknowledge submissions or answer questions individually. ■

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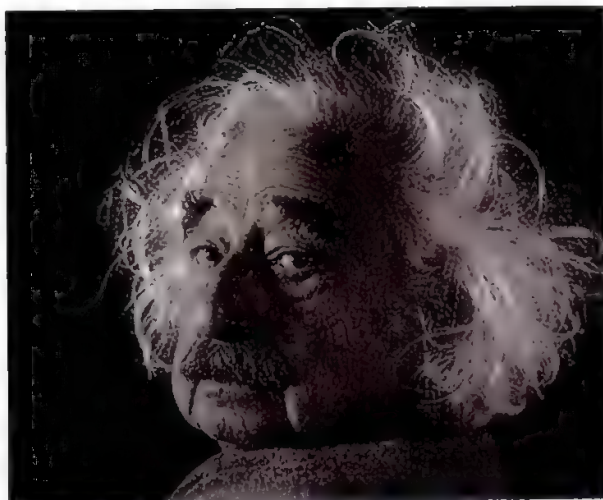
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M. David Stone

The Working Word

FRAMING FROM THE HEADER

The Working Word column in the July 1991 issue of *PC Magazine* discusses how to use graphics lines and frames in a *WordPerfect* header to produce vertical lines and boxes on every page of your document.

In discussing frames, you suggested setting the header page margins at 0.75 inches with the document page margins at 1 inch, so that the frame will be larger than the text area. This will work for left and right margins. But if you set the top and bottom margins before you create a header, the header margins cannot be smaller than these. What's more, in most cases a change in the page margins (unlike line margins) doesn't take effect until the next page.

Richard Barrett
Oswego, New York

PC While it's generally true that a change in the top or bottom margin doesn't take effect until the following page, there is one important exception—an exception that lets this technique work. If the margin change comes before all the body text on the page, *WordPerfect* 5.0 and 5.1 will use the new margins immediately.

I'm using the term *body text* to include spaces, carriage returns, and other non-printing characters that merely produce white space. This doesn't include text in the header, which prints separately from the body text on the page. And most important, it doesn't include the *codes* for the header.

The previous discussion of this technique considered only documents having the same format on each page. By defining the frame once in the header, you eliminate the chore of defining separate frames for each page. You also avoid the clumsiness of having to edit text within each frame separately or having to keep the text in separate files.

However, as shown in Figure 1, you can also use this technique when you

■ **FRAMING FROM THE HEADER:** Use *WordPerfect's* header feature to create text boxes and vertical lines in your documents.

■ **PRINTING ULTRALONG DOCUMENTS IN WORD:** How to print book-length files in *Microsoft Word* 5.0 and 5.5.

want to use different-size frames and different text margins from page to page.

To create a single format that lasts for the remainder of the file (or until you change it), using 0.75-inch margins all around for the frame and 1-inch margins for the body text, start by entering the margins for the header frame as the very first entries in the file: Use Shift-F8 to go to the Format screen, choose Page, Margin, and then set top and bottom margins to 0.75 inches. Next, hit Enter to return to the Format screen, and use the Line, Margins command to set the left and right margins to 0.75 inches.

Now you can create the header and enter the frame, as described in the July issue. Briefly, assuming you don't already have a header, go to the Format screen, and choose Page, Header, A, every Page. Then, while in the Header editing screen, tap Alt-F9, Figure, Create, and define the figure with Horizontal position set to Full (in Version 5.0, this choice is called Both Left and Right), Wrap text around box set to No, and Size set to 7 inches wide by 9.5 inches high. Note, however, that *WordPerfect* may show the size somewhat differently. On my system, for example, it shows the height as 9.33 inches unless I change the margin settings. You can accept the defaults for the other settings. After you create the

frame, return to the Format screen and enter 1-inch margins for the body text, using the margin commands as before.

If you want the same format for the entire document, you're now finished. However, it's a good idea to check first to make sure that *all* of these entries come before *any* body text in your file. Hit Alt-F3 (reveal codes), and you should see all five codes—top and bottom margin code, left and right margin code, header code, another top and bottom margin code, and another left and right margin code—all together, without any spaces or carriage returns before them or between them. If you see any extra text or codes, delete them or move them elsewhere.

At this point, if you have any text in your file, you can print it or look at it on-screen with the Print, View Document (Shift-F7, 6) command. The result should look much like the right-hand page shown in Figure 1.

If you want more than one format in the file, you need only repeat the process on other pages, adding two extra commands and appropriate settings. First identify the text you want to format differently than the page before. Now enter a hard page break with Ctrl-Enter immediately before the first character of body text that you want on the new page. Immediately after the page break, enter the Margin commands for the new frame, a Discontinue command for the old header (Shift-F8, Page, Header, A, Discontinue), a definition for the new header complete with frame definition, and, finally, the new margin commands for the text.

The two pages in Figure 1 are actually the second and third pages of a file. The settings for the left-hand page are 1.75-inch margins all around before the header and 2-inch margins after. The settings for the right-hand page are 0.75-inch margins before the header and 1-inch margins after.

Before we leave the subject of header-based page formatting, there is one additional wrinkle for header-based lines that's

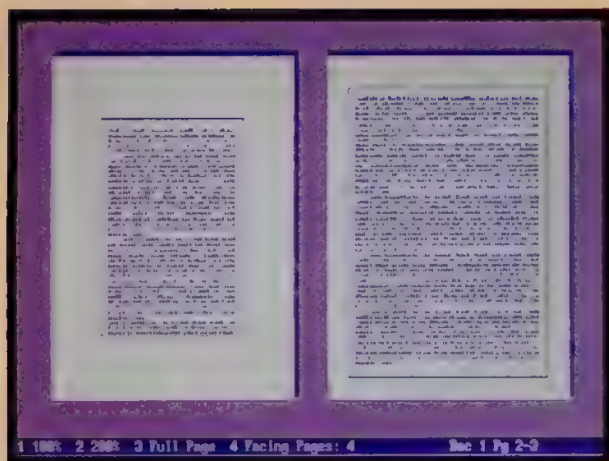


Figure 1: As this *WordPerfect* print preview screen shows, if you embed frames in a header, you can still vary the size of the frames from one page to the next.

worth mentioning. The July 1991 *Working Word* column discussed header-based lines as well as frames. The procedure is similar to attaching frames, except that once you're in the Header editing screen, you give the Alt-F9, Line command instead of the Alt-F9, Figure command.

Briefly, when you create a graphics line, *WordPerfect* 5.0 and 5.1 will let you define the width of the line, the gray shading, the horizontal position on the page, and the vertical position of the starting point along with the length of the line. (For more information, see *The Working Word*, July 1991, page 461.)

One of the choices for horizontal position is *Between columns*, which also lets you select which column each line follows. As the earlier column pointed out, you can't generally use this choice when you define graphics lines as part of the header. Instead, you have to determine where the line should go, and enter the appropriate horizontal position with the *Horizontal position, Set* command. This is tedious at best, and requires repeated trial and error if you want to get the positioning just right.

However, in *WordPerfect* 5.1 (though not in 5.0), you can take advantage of the *Between columns* choice if you enter a multicolumn code in the header itself to match the multicolumn code in your text. The multicolumn code should go before the code that defines the vertical line. Entering the code is similar to entering a graphics line or frame. Go to the Header editing screen, type Alt-F7, Column de-

fine, and define Newspaper-style columns to match the columns in your body text. Don't forget to enter a column On command as well. With the column code in the header, you can now define lines as being between columns.

Note that once you've defined multiple columns in your header, you can use those multiple columns to create individual column headings. Use Ctrl-Enter to mark the end of each column and to move to the next column to the right for all except the rightmost column. Once you've created the headers in each column, you can use *WordPerfect's* standard navigation techniques (Ctrl-Home Right Arrow or Ctrl-Home Left Arrow) to move from one column to another within the header. You may find this easier than using tabs to align column headings with the appropriate columns.

PRINTING ULTRALONG DOCUMENTS IN WORD

When you're creating a book-length document in *Microsoft Word* 5.0, it's usually most convenient to split the text into separate files; for example, with a document divided into chapters, you could put each chapter in its own file. When you print, however, you'll probably want to maintain a continuous page-numbering scheme throughout the document. Unfortunately, if you try using the *Transfer Merge* command to merge the files, you may overflow RAM. On my system, *Word* can handle about 140 pages at a time, spread over about 30 chapters.

If you run into this problem, you can still print consecutive page numbers by using the *Format Division Page-numbers* command. Simply set the starting page number for each file. To reduce the number of files you need to adjust, consolidate the smaller, working files into a few larger files before printing.

Kirby Hansen
Sunnyvale, California



Word should not be running out of RAM in the situation you describe. More precisely, when *Word* uses up the available RAM, it normally writes data to disk in a temporary spillover file. To prove the point, I used the *Transfer Merge* command to merge multiple copies of a 260-page file into memory. On my desktop system, equipped with 4MB of RAM, *Word* was still going strong at well over 3,500 pages—enough to create a file just shy of 8MB.

More important, using the *Transfer Merge* command is the wrong approach for this task in any case. If you have a set of files that you want to print with continuous page numbering, the tool of choice is the *Print Merge* feature, courtesy of the *Include* statement.

The *Include* statement lets you insert an entire file into a *Print Merge* master form. What makes it appropriate for this task is that you can create a master file that contains nothing but *Include* statements. If you have each chapter in its own file, you only have to create a master file with one *Include* statement per chapter file. *Print Merge* the master file, and you print the entire book.

In general, the master file should take the form

```
<Include ch1.doc>
<Include ch2.doc>
<Include ch3.doc>
```

(To enter the chevrons, use Ctrl-[for the left side, and Ctrl-] for the right side.)

When you print, use the *Print Merge Printer* command rather than the *Print Printer* command, and *Word* will print the files in the *Include* statements.

There are a few other things to consider. In particular, if you want each chapter to start on a new page, make sure you insert a page break with Ctrl-Shift-Enter either after each *Include* statement or at the end of each file. Note that you must be consistent in using one strategy or the other. If you have a page break in

both places, *Word* will observe both page break commands, and you'll wind up with a blank page.

To print the page numbers, you have two choices: You can use either a header or footer, or use the automatic page numbering feature. Whichever you choose, you'll want to add the page numbering to the master file. To turn on *Word*'s automatic numbering feature, use the Format Division Page-numbers command. (In *Word* 5.5: formatT, Section, page numbeRs: Alt-T, S, Alt-R. This will print consecutive page numbers across the files listed in Include statements).

If you want to use a header to print

If you have a set of files that you want to print with continuous page numbering, the tool of choice is the PrintMerge feature.

the page numbers, you must first create the header at the top of the master file. To do this, insert a blank line, choose Format, Running-head (formatT, Header/Footer in Version 5.5), and define the paragraph as a header or footer (Top or Bottom), then set the text and paragraph formats to taste. Add whatever text you want in the header, then type the word *page* followed immediately by F3. *Word* will replace the word *page* with the (page) marker, and will insert the page number when it prints.

TIPS FROM WORKING WORDSMITHS

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by
Craig Stinson

Spreadsheets

BEST-FIT CELL HEIGHTS IN EXCEL

Microsoft Excel 3.0's Format Column Width... dialog box includes a Best Fit button, which automatically makes columns wide enough to accommodate their longest entries. Unfortunately, no similar button was added to the Format Row Height dialog box.

However, you can get this capability with the following simple macro:

```
SetHeight.Best  
=ROW.HEIGHT(,,,3)  
=RETURN()
```

This macro is particularly useful for working with wrapped text—another feature new with Excel/3.0. Wrapped text is great for comments or long fields in a database. Unlike a justified text area, all of the wrapped text is in a single cell, allowing you to sort or otherwise manipulate a database without scrambling the text. The catch is that moving the wrapped text (which happens with sorting), changing the column width, or changing the font used will probably leave you with an inappropriate row height.

If you add a line or two to a label containing wrapped text, Excel automatically expands the row height. But if you delete lines from such a label, Excel not only doesn't shrink the row height, it leaves the short label hanging from the top of the row space instead of flush against the bottom.

The answer to all of these problems is the Best Fit macro. Assign it the shortcut Ctrl-H, and you can automatically scale any row to the proper height for its tallest entry by selecting any cell in the row and pressing Ctrl-H.

Because I use this macro frequently, I keep it on a macro sheet stored in the XLSTART subdirectory of my Excel directory. That way, it loads automatically whenever I run Excel.

Russell W. Schmidt
Knoxville, Tennessee

■ **BEST-FIT CELL HEIGHTS IN EXCEL:** You can choose Best Fit when specifying column widths in Excel; now our spreadsheet guru explains how to get best-fitted cell heights.

■ **GRAPHING MORE THAN SIX SERIES:** Need to plot more than the six data series 1-2-3 supports? Here's how.



Word-wrapped labels are indeed a handy feature in Excel 3.0. To create such labels, use the Format Alignment command and select the Wrap Text check box. But Mr. Schmidt is right that Excel does not do a graceful job of handling changes to the size or position of wrapped text labels. If you cut and paste

a multiline label from one row to another, you typically get two problems. The label is illegibly scrunched up in its new home, and the row you left behind is unnecessarily deep. You have to adjust both rows by hand to make the worksheet look right. (Contrast this unfriendly behavior with Excel's handling of large point sizes. Move a 24-point heading from one row to another, and both rows adjust appropriately.)

There is a simple way to get best fit—with the mouse. In the frame at the left side of the worksheet, position the mouse on the lower boundary of the row whose height you want to adjust. When your mouse pointer changes from a white cross to a slender black cross, double-click. This does exactly the same thing as executing =ROW.HEIGHT(,,,3) from a macro. (An analogous mouse shortcut is available for the Best Fit option of the Column Width command. Just double-click on the frame border to the right of the cell you want to adjust.)

You can use the mouse shortcut with multiple rows as well as single rows. Just select all the rows you want to adjust (if

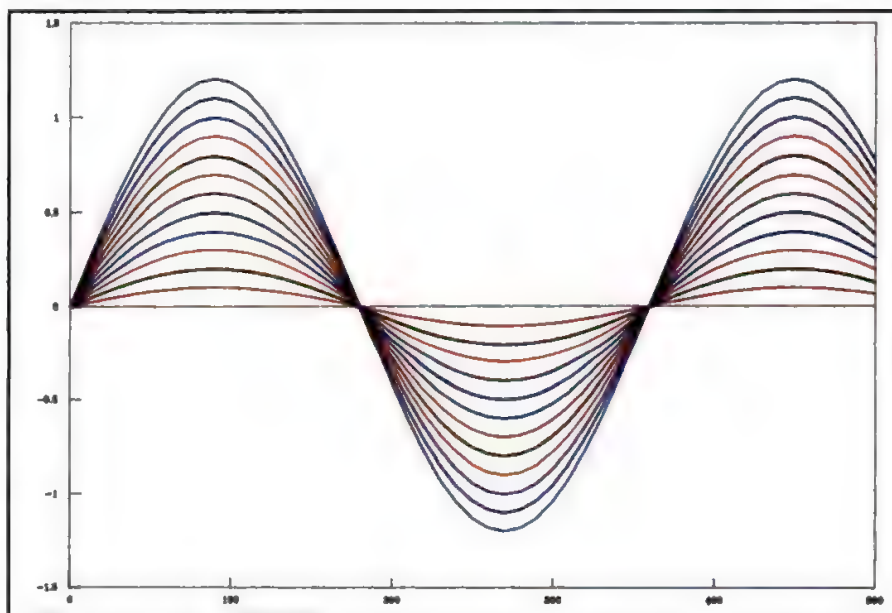


Figure 1: This plot illustrates that you can have more than six data series in a 1-2-3 graph.

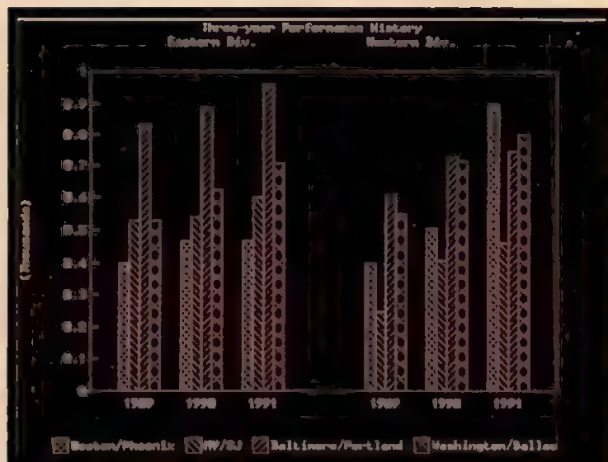


Figure 2: A bar graph that appears to plot eight series. The doubled legend entries show that there are really only four series.

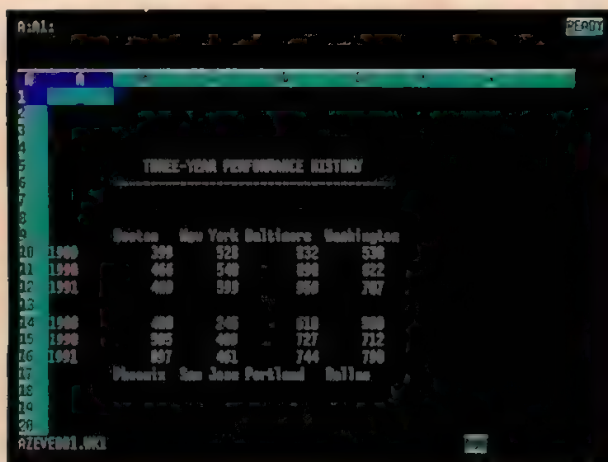


Figure 3: The data in this worksheet was used to generate the graph in Figure 2.

the rows are not in a contiguous block, hold down the Ctrl key while selecting each one). Then double-click on any one of the frame boundaries. *Excel* will adjust all the selected columns.

GRAPHING MORE THAN SIX SERIES

Lotus 1-2-3, Release 3.x, has excellent graphing capabilities. But there are times when I need to get beyond its limit of six data series per graph. I have found a way to do this for *x,y* graphs. Here's how:

(1) Set up your spreadsheet as usual for the *x*-axis range, followed by up to the six normal data ranges (A through F).

(2) Assuming you're using a columnwise arrangement, duplicate the *x*-

axis values into the same column below the first set of *x* values. Leave one blank row between the two sets.

(3) Construct up to six additional ranges, using the same columns as previously defined for ranges A to F.

(4) Repeat steps 1 through 3 for as many sets as necessary.

(5) Tell the Graph program that you want to plot an *x,y* graph and identify your ranges as extending from the first row of the first set to the last row of the last set.

For example, suppose you have 12 series, each consisting of 100 points. You could set this up with identical *x*-axis values in cells A1..A100 and A102..A201. Your first and seventh data series would be in B1..B100 and B102..B201, respec-

tively, but you would define the entire range B1..B201 as your A data range. Your second and eighth data series, in C1..C100 and C102..C201, would constitute your B range—and so on.

The graph displayed in Figure 1 uses this technique to plot 12 sine waves for the range of 0 to 500 degrees, with radii ranging from 0.1 to 1.2 units.

Joseph A. Azevedo
Miami, Florida



This technique (which can be used in 1-2-3, 2.x and 3.x) works well with *x,y* graphs, because the *x* values are treated as data points, not as labels. 1-2-3 sees the A through F ranges as large data sets with a discontinuity (the blank row). If you don't leave that blank row in the middle, you'll get lines connecting your first and seventh series, your second and eighth, and so on.

With the rest of 1-2-3's graph types, repetition of *x* value points simply means repeated axis labels. For most kinds of business charting, that means the program is still limited to six series.

Nevertheless, you might occasionally have a use for Mr. Azevedo's technique with graph types other than *x,y*. Figure 2 is a bar graph that appears to plot eight series. The worksheet from which this graph is derived is shown in Figure 3. Note that the second title line incorporates a lot of white space, so the words at each end seem to label the east and west clusters. The legend, unfortunately, betrays the fact that there are really only four series in the plot.

A better way to get past the six-series limitation for non-*x,y* graphs in 1-2-3, Release 2.x and 3.x, is to use a publishing add-in. Both *Allways* and *WYSIWYG* (or *Impress*) allow you to superimpose graphs on the worksheet. So, to plot an eight-series chart, you can create two four-series charts and overlay them.

For more about this technique, see "A Size Limitation on Allways Graphs" in the June 11, 1991, *Spreadsheets* column.

HINTS, TIPS, QUESTIONS

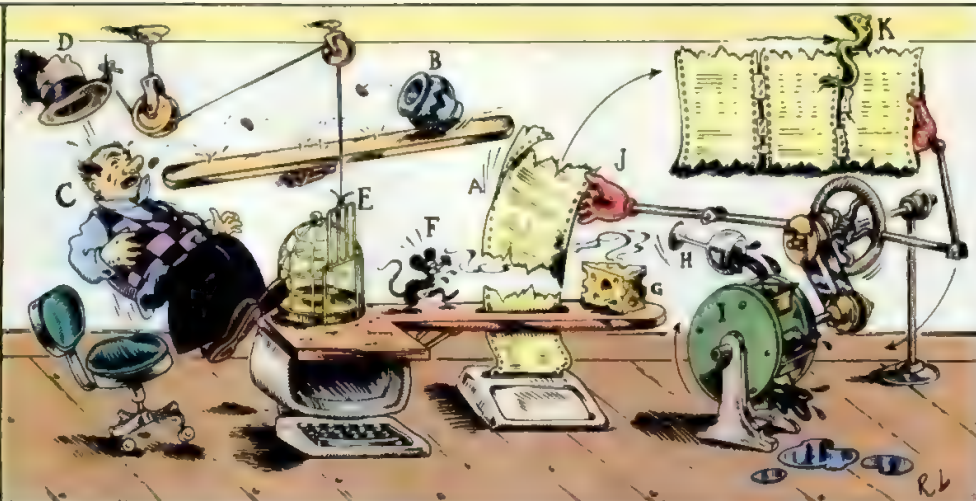
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RISING SPREADSHEET (A) KNOCKS MEXICAN JUMPING BEANS (B) INTO MOUTH OF NEUROTIC MAN (C) WHO IS SO DISCOMBOLATED THAT HIS HAIR STANDS ON END, DISLODGING HAT (D) WHICH OPENS CAGE (E) AND RELEASES EPICUREAN MOUSE (F).

MOUSE, INSPIRED BY SCENT OF PERFECTLY AGED CAMEMBERT CHEESE, GNAWS THROUGH SPREADSHEET, ONLY TO DISCOVER HE HAS BEEN FOOLED BY AROMA OF OVER-RIPE GORGONZOLA (G).

IN A FIT OF PIQUE HE SPILLS VINTAGE WINE (H) INTO WATER-WHEEL (I) WHICH TURNS PULLEY THAT CAUSES GLOVE (J) TO GRASP SPREADSHEET AND MOVE IT TO TAPING AREA.

SHEET IS TAPED SECURELY IN PLACE BY TRAINED ADHESIVE TAPE WORM (K).



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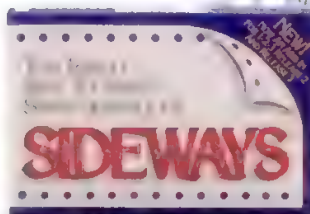
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by
Frank J. Derfler, Jr.

Connectivity

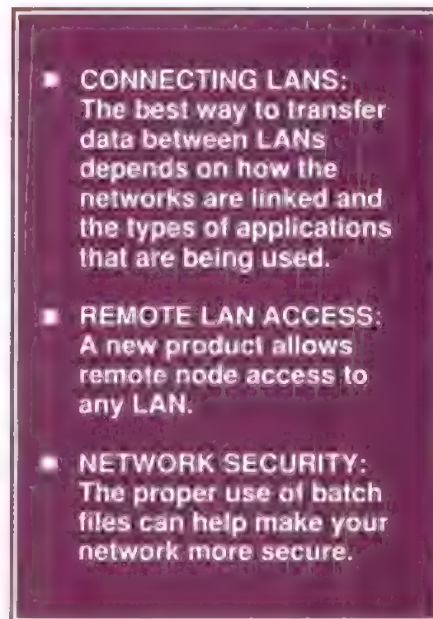
CONNECTING LANS

During our testing of inter-LAN connection options for the reviews published in the September 10, 1991, issue of *PC Magazine* ("From LAN to WAN: Bringing Your Networks Together"), we learned a few things about using *NetWare* across inter-LAN links.

A LAN segment is a collection of nodes ranging in number from one to some large number that a repeater, bridge, or router treats as one group. When you link LAN segments together with bridges, the bridges read the address information of every media-access control (MAC) Ethernet or Token-Ring frame and decide which frames to pass across the inter-LAN link. Under *NetWare*, all servers must see the same network number on all the bridged segments so they know they are part of the same logical network.

Bridges usually don't modify the frame when they pass it to the next LAN segment, so the mixture of large and small packets of data created by typical application programs and carried inside the MAC-layer frames flow between the LAN segments just as they flow on the local network. Some bridges, sold by such companies as IBM and Digital Equipment Corp., can strip the IPX or DECnet packets out of one type of frame (like Ethernet) and reinsert them into another type of frame (like Token-Ring), so you can link LANs with these very different MAC-layer architectures. These bridges, though, are a special category of products. In most cases, the data traffic between bridges flows without modification of the frames or the data they contain.

However, when you connect LAN segments with routers, the routers discard the MAC-layer frame and discriminate among the packets they forward on the basis of addresses generated by software conforming to higher-level protocols (such as IP, XNS, or IPX). Routers typically strip packets out of the frame they arrived in, insert them into some other type of frame (for example, SDLC or X.25) to cross the



inter-LAN link, and then reinsert them into a frame appropriate for the destination LAN.

Generally, routers are more cost-efficient than bridges in larger installations and in small installations carrying a lot of traffic because they don't load the expensive inter-LAN circuits as heavily as bridges.

When you use routers, you must tell the *NetWare* servers that they are on different LAN segments by giving each segment a different network number. However, when *NetWare* sends packets to a network with a different network number, it sends only 512 bytes of data per IPX packet regardless of the network adapters you use. So while large efficient frames can flow between bridges, *NetWare* causes routers to transfer data in spoon-size packets of 512 bytes. Moving data in small packets is inefficient, and inefficiency is something you really want to avoid when you're paying for expensive long-distance inter-LAN circuits. If you use routers to link remote *NetWare* LANs, you need to look carefully at both the routers and the appli-

cations running on the LANs.

Both Newport Systems Solutions and Novell offer options for *NetWare* that allow their routers to hold and aggregate small packets for more-efficient transmission across the inter-LAN link. With some types of applications this can improve throughput by 30 to 65 percent, but the efficiency depends on the type of traffic running over the inter-LAN links. If most of the traffic moving between LANs is in small frames (as might be generated by programs doing query/response, keyboard entries, or database updates), then aggregating data into larger blocks doesn't make sense. But if you transfer files across the inter-LAN circuits and use applications that move data in big blocks, then sending big blocks between routers is the best technique.

Deciding whether to use a bridge or a router and then whether to aggregate data or to let it pass unmodified is a significant challenge for a *NetWare* administrator. You'll need to carefully study the activity of your applications and the nature of your inter-LAN links to make the best choices.

REMOTE LAN ACCESS

I have some sophisticated users who would like to call into our LAN from their laptops and have the usual network drives available. But some of them run Windows on their portable PCs and they don't like the idea of trying to remotely control a Windows application running on an access server. I know that operating as a remote client is slow, but I've read a lot about the Shiva NetModem and it seems to provide an adequate response. The problem is, we don't use *NetWare*. Do you have a solution?

William Marler
San Diego, California



Until the Windows graphical user interface caught fire, the modem remote-control method of making a remote connection to a LAN was al-

ways much more efficient than the remote client method. The remote client connection tries to push many layers of messages carrying different network packets and acknowledgements across relatively slow telephone lines. The remote-control connection passes only keystrokes and screen images across the modem connection, so typically it's much faster.

However, two things have happened in the last 12 months or so to challenge that superiority. First, the multipixel changes that take place in a Windows graphics screen every time you click your mouse take several seconds to traverse even a fast modem link, restricting the efficiency of the remote-control approach to something like that of the remote client technique. At the same time, companies like Shiva Corp. developed methods to reduce the amount of network traffic moving over the modems and telephone line, significantly reducing the time needed to move data under the remote client arrangement.

The authors of today's remote-control programs have learned tricks for improving the slow transmission of graphics screens. But remote client and remote-control techniques compete relatively equally in modern installations.

Shiva's programmers tokenize certain repetitive elements of the *NetWare* Core Protocol packet within the IPX packet to significantly reduce the overhead and improve throughput. This means that you can use your remote computer as a part of the LAN while still retaining useful throughput. But so far Shiva's wizards have only been able to work their trickery on *NetWare*.

There's another product, however, that provides efficient remote client operation for any network—the *Remote LAN Node* (RLN) from Intercomputer Communications Corp. (ICC). Unlike the Shiva NetModem, the RLN system will work with any network operating system that has drivers for either the Clarkson Packet Driver or the Microsoft/IBM NDIS interface. You can contact ICC at 513-745-0500 for more information.

The *Remote LAN Node* is a software product that runs on any networked PC. The PC acts as an access server for remote clients. The server software can theoretically handle as many as 16 remote connections, so you'll want to run it on a PC with at least an 80386SX processor running at 20 MHz. ICC sells its own mul-

tiport RS-232 adapter board with microprocessor augmentation to relieve the PC's CPU of many I/O tasks.

Each client PC calling into the LAN runs all of the LAN software it needs such as IPX.COM and NETX.COM for *NetWare*. In the case of *NetWare*, you'd configure the IPX module for NDIS. A piece of RLN software in the client PC redirects the network communications out a serial port and configures it for remote communications.

The client software and server software communicate using a relatively new industry-standard protocol called Point-to-Point Protocol (PPP). PPP provides some very specific tokenizing and compression techniques that work very well on network packets, including Tinygram Compression, which strips the trailing zeros from any minimum-size packet, Header Compression, which reduces redundant and unnecessary data from a header, and Protocol Length Compression, which handles the problems of packets broken up for transmission. PPP doesn't do error handling, so you still need to use a modem with V.42 or MNP services to insure the integrity of the data going over the line.

In effect, remote client products like the Shiva NetModem and ICC's *Remote LAN Node* make it easy to extend the LAN into many different locations and to link LANs. The NetModem can act as a router all on its own, and *Remote LAN Node* doesn't know or care if it is moving data for laptops calling from an airport or for networked PCs moving data from server to server.

NETWORK SECURITY

We use a *LANtastic* network and love it, but we have one security concern. We want to give some employees the right to read our client list *without* being able to print it out or to copy it to a floppy disk. That list is our bread and butter and we can't risk losing it!

Bill Ford
Austin, Texas



Unfortunately, there is no way you get the degree of security you want under *LANtastic*'s standard options. And I don't know of any other operating systems where read-only file rights will prevent a print screen command. Under *LANtastic*, any person who

has the rights to read a file can also save it and print it.

But there are other ways to reach your goal. By combining batch files with some utilities available on the Artisoft BBS, you can thwart would-be thieves and improve your overall security.

The key to security and smooth operation on *LANtastic* networks (and even on *NetWare* LANs) lies in using batch files properly. You can make a menu of batch files to limit the access people have to programs and resources and sometimes to even eliminate the resources they usually have. For example, under *LANtastic* the command

```
NET USE LPT1:
\\SERVERNAME\CDRIVE\NUL
```

will route any print job aimed at LPT1 to the NUL device. This rerouting will keep even a Shift Print Scrn command from printing.

Each batch file that launches an application can first set the network resources to whatever is appropriate for that application. But by itself, the batch file won't prevent copying a file to a floppy disk or even prevent someone from using Ctrl-C to break out of the batch file and reroute the printer. There's a file on the Artisoft bulletin board (602-293-0065) called SUCUTIL2.ZIP, which contains several utilities you can use to disable the Ctrl-Break and [[Ctrl-C]] keys in batch files to keep the user from breaking out. Other programs in the same file disable the floppy disk drive.

Finally, I suggest you do all log-on and redirection from within batch files and compile your batch files to keep people from changing them. The most effective approach to security involves limiting knowledge and privileges from the very beginning.

NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We'll pay you \$50 for any tip we print. Please submit your letter on-disk along with a printout. Then mail your contribution to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016. You may also contact Frank J. Derfler, Jr. via MCI Mail (MCI ID: 240-2931) or the LAN Labs fax machine (904-837-0737). We regret that we're unable to acknowledge submissions or answer letters individually. ■



JIM POWELL

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Two years ago, a lot of people at Texas Instruments found the mainframes difficult to use and inflexible.

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Jim's group was able to quickly develop client-server applications, like the executive decision support system. Which means the users didn't have to wait forever to get the computer support they

"NOW I CAN PUT APPLICATIONS INTO THE HANDS OF PEOPLE THAT WOULDN'T HAVE GOTTEN THEM OTHERWISE."

needed. And with Windows, the information on the mainframes was easier to access. In short, Jim was able to get the right information, to the right people, the right way.

For a case study on Texas Instruments' migration to Microsoft's client-server solution, call us at (800) 992-3675, Dept. X35. We'll tell you how you can profit from their experience.

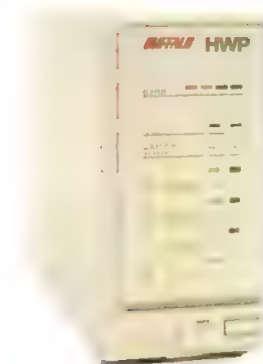


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HWP	5 Parallel	3/2 4/1	256KB - 16MB	Pop-up or Buttons	\$295 / 256KB \$395 / 1MB
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by
Craig Kerwien

PC MagNet

Four years ago, *PC Magazine* introduced PC MagNet, an on-line service that let you interact more closely with the magazine. You could download the latest utilities, talk to the editors, authors, and columnists, and receive valuable advice. Today, PC MagNet provides an even greater variety of tools and resources to help you stay informed about the products you buy, use, and sell.

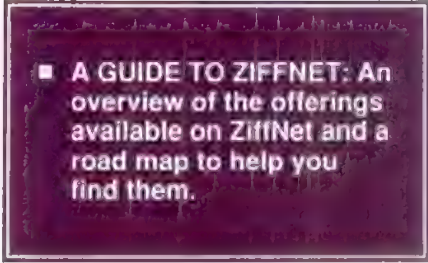
One of the beauties of electronic publishing is the ease with which we can add new services and improve our current ones. Hence, hardly a week goes by without some change. It's no surprise, then, that this would also be the source of our greatest challenge: How do we keep you informed of all these on-line changes?

One way we try and do this is on-line, in the Ziff Highlights and Information section. Even if you're a frequent visitor to PC MagNet, a quick read of this section when you first dial in will let you know what files have just been uploaded from the different publications, what new services have been launched, and a summary of the discussions in the various forums.

Another way is through this column. For over a year we've been covering the additions and improvements to our on-line services in these pages. And while adding services is good, it often means reorganizing the current ones. So in this issue we'll take a look not only at the new services, but also where you can find them and how you can access them.

ZIFFNET

PC MagNet's success inspired a commitment from Ziff Communications to develop ZiffNet, a comprehensive on-line information service for active buyers and users of personal computer products. PC MagNet is now a part of ZiffNet, which acts as an umbrella for news, reviews, analysis, and opinion from Ziff-Davis publications (such as *PC Magazine*, *PC Computing*, *PC Week*, *Computer Shopper*, *PC Sources*, *MacWeek*, and *MacUser*), plus a variety of other com-



■ **A GUIDE TO ZIFFNET:** An overview of the offerings available on ZiffNet and a road map to help you find them.

mercial databases and news services. ZiffNet's range of information services includes buying and technical support, computer industry news and research, and productivity enhancement. All these ZiffNet services are diagrammed in the sidebar "The ZiffNet Road Map."

Like PC MagNet, ZiffNet is also a great source for software, with thousands of utilities, freeware, and shareware programs available for downloading.

The Software and Utility Library—also known as SOFTLIB—is the central clearinghouse for the humbly named "world's greatest utilities" from *PC Magazine*. From here you can download the latest utility from each issue. Since 1985, *PC Magazine* has commissioned over 100 utilities and applications—such as TED, PRUNE, and DDIR—as both programming demonstrations and useful productivity tools. You can typically find the authors of these utilities on-line to answer questions and provide support.

SOFTLIB also has high-quality tools and applications, including:

- *PC Computing*, *PC Week*, and *Computer Shopper*;
- Shareware and freeware from the Public Brand Software catalog;
- Shareware from members of the Association of Shareware Professionals (ASP), including the programs on the Shareware's Top Ten List—the most popular files sold from shareware disk vendors (updated monthly); and
- The latest release of the industry-standard *PC Magazine* benchmark tests. (Note that while *PC Magazine* utilities and benchmark tests are copyrighted, they

may be freely distributed to anyone. However, making copies for commercial and resale purposes is prohibited.)

TALK TO US

In ZiffNet's interactive discussion forums you can talk to the writers and editors of *PC Magazine*, *PC Computing*, *PC Week*, and *Computer Shopper*, and let them know what your needs and interests are. Or you can talk to the magazines' columnists, such as Will Zachmann and John C. Dvorak, and let them know if you agree with their opinions. This kind of dynamic interaction is invaluable and intriguing: It keeps editors and authors in tune with you and often gives way to in-depth discussions on the issues facing the industry.

The forums are organized into message areas for discussion and file libraries for software. The current forums are

- *PC Magazine* Editorial Forum;
- *PC Magazine* Utilities and Tips Forum;
- *PC Magazine* Programming Forum;
- *PC Magazine* After Hours Forum;
- *PC Computing* Editorial Forum;
- *PC Week* Editorial Forum;
- *Computer Shopper* Editorial Forum;
- Public Brand Software Forum.

To access any one of these areas, simply type the word GO followed by the corresponding word given in parentheses on the ZiffNet Road Map at any prompt. For example, to access *PC Magazine's* Editorial Forum, type GO EDITOR.

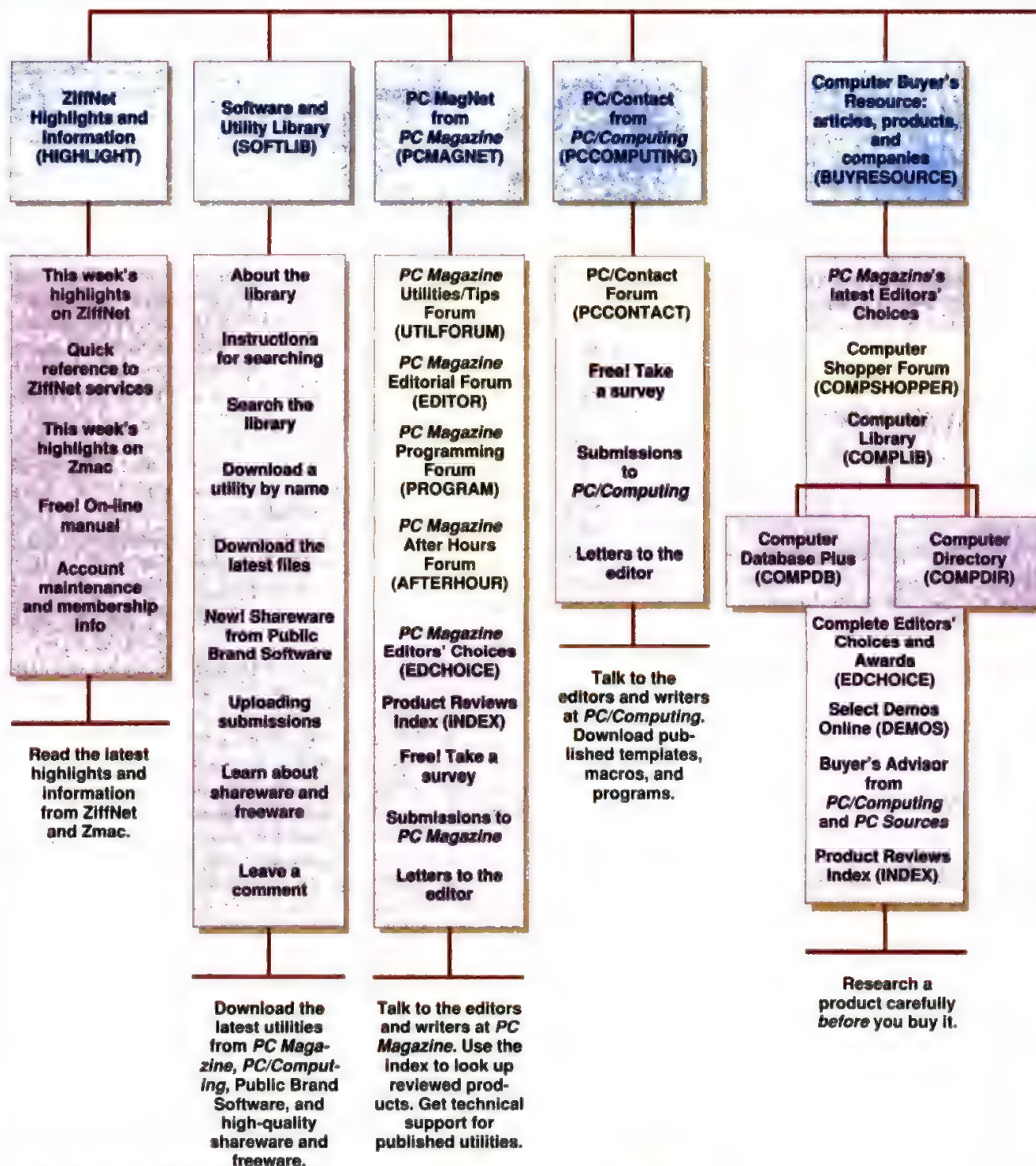
The forum sysops (system operators) maintain the libraries of downloadable software categorized by forum topic and the interests of its members. They also oversee and administer the reader services offered by each magazine, such as electronic mailboxes for letters to the editor and column submissions.

GET EXPERT ADVICE BEFORE YOU BUY

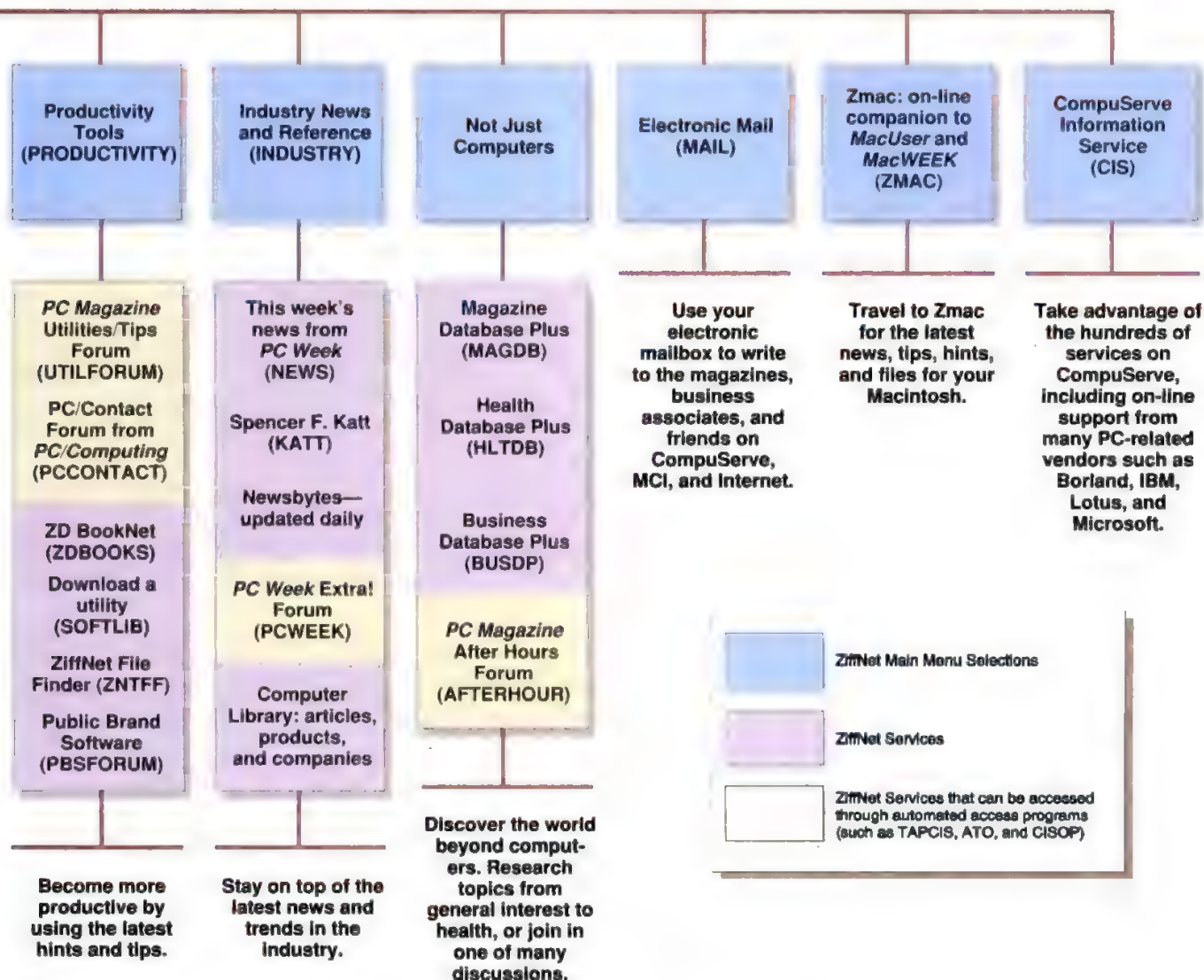
There are two new services you should watch for in early 1992. The first is on-line technical support from the Cobb



ZIFFNET ROAD MAP



NOTE: GO words are given in parentheses. If you're already a CompuServe subscriber, be sure to include the "ZNT:" Gateway code before the GO word. For example, to go to the ZiffNet File Finder, enter GO ZNT: ZNTFF.



HOW TO SUBSCRIBE TO ZIFFNET

- To find the phone number nearest you, using your modem, dial 800-346-3247. When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you. Or you can call 1-800-635-6225 and follow the instructions and note the number.
- Set your communications software to 300, 1,200, or 2,400 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex.
- Dial the local number. When you connect, type Ctrl-C.
- At the HOST NAME prompt, type CIS.
- At the USER ID prompt, type 177000.5000.
- At the PASSWORD prompt, type PC*MAGNET.
- At the ENTER AGREEMENT NUMBER prompt, type Z11D9200.
- Register your name and enter your MasterCard, Visa, or American Express card number. (If you'd like to have your company billed instead, call CompuServe at 800-848-8990.)
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There are no up-front subscription charges; you pay only for the time you spend on-line. CompuServe members can join by entering GO PCMAG at any CompuServe "!" prompt. CompuServe Customer Service can be reached at 800-848-8990. Outside the United States, call 614-457-8650.

PC MagNet costs \$12.80 an hour for 1,200- or 2,400-bps service, or \$6.30 an hour for 300-bps service. Billing is based on 1-minute increments.

Group, a publisher of books and newsletters for popular software such as DOS, Lotus 1-2-3, Microsoft Word, and so forth.

The second is a buyer's service, a group of searchable databases with the product information you need to make an informed buying decision. While the Ziff-Davis magazines comprehensively review a wide range of products, your buying decisions may not always coincide with the appearance of a printed review. However, by accessing these databases, you can easily find the reviews you need when you're ready to buy (the capitalized word next to each item is the GO word):

- **Product Reviews Index (INDEX):** A database of abstracts of all product reviews that have appeared in *PC Magazine*, *PC/Computing*, and *PC Week*. There are no related surcharges, and a downloadable version of *PC Magazine* reviews is available.

- **Computer Database Plus (COMPDB):** A database of abstracts and full-text articles from most computer-related publications, including many industry newsletters. Full articles are available from *PC Magazine*, *PC/Computing*, *PC Week*, *Digital Review*, and over 40 other journals. There is a surcharge.

- **Select Demos On-line (DEMOS):** Demonstration versions of 100 of the most popular software programs. Many demos are working models of the actual programs.

- **Computer Directory (COMPDIR):** A database of more than 70,000 computer-related products from more than 12,000 manufacturers. Each listing provides pertinent information about the product or company you're interested in. There is a surcharge.

- **The Editors' Choice Database (ED-CHOICE):** A listing of *PC Magazine*'s Editors' Choices for the past two years, with the most recent issue's awards highlighted on a special menu item. The Most Valuable Product (MVP) winners selected by the editors of *PC/Computing* are included as well.

If you prefer to perform your own product research, "Buyer's Advisors" from *PC/Computing* and *PC Sources* have product worksheets that give you a detailed list of product specifications important for a particular product category. It's a good way to make sure you don't forget something in the buying process.

PRODUCTIVITY TOOLS

Helping you be more productive has always been our goal, and nowhere is this

more evident than in *PC Magazine*'s Utilities and Tips Forum (UTILFORUM). Not only can you receive technical support for the magazine's utilities, but you can also get support for commercial products as well. Technical support is handled by editorial staff, sysops, utility authors, and other readers, and important message conversations, or *threads*, are archived and saved for retrieval for future support.

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HOW TO ACCESS ZIFFNET

All you need to access ZiffNet is a modem and communications software. Using any of the popular terminal packages, such as *ProComm*, *Crosstalk*, or *Qmodem*, you can connect to CompuServe's mainframe interface with a character-based menu structure and the option to use command-line instructions. Many people use this setup for downloading files in SOFTLIB, and for viewing our menu-based services, such as Newsbytes, Editors' Choice database, and other reference databases. For access information and connect charges, see the "How To Subscribe to ZiffNet" in the ZiffNet Road Map.

CompuServe has recently introduced the *CompuServe Information Manager (CIM)*, which provides a character-based window environment to forums and other services. ZiffNet offers a version of *CIM* that's customized with the ZiffNet menu structure.

NEED HELP?

If you're new to ZiffNet, you can learn the ins and outs of forum navigation without incurring on-line charges in the Practice Forum. Once there, you can also download a copy of the ZiffNet manual. Further on-line assistance is provided by ZiffNet's talented crew of sysops; just leave a message directed to "Sysop" in any forum. Questions about billing, change of address, and other account maintenance changes should be directed to the Feedback area (GO FEEDBACK).

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by
Scott Chaney

Utilities

If you need to bill your clients on an hourly basis, keep tabs on the time you spend on PC MagNet, or determine the ratio between business and personal use of your computer, what you need is TRACKR.COM. Using the rate information you enter in a simple client data file, TRACKR logs the time you spend on each project and then automatically prepares a printable billing report.

A 7K memory-resident utility, TRACKR lets you create or switch tasks at any time, stop the clock temporarily, switch applications with the clock running, combine multiple separately timed tasks for the same client into a single billing report, and update your task log at a keystroke. Increments for partial-hour calculations can be as small as 1 minute. If at any time you are in a TRACKR menu and wish to return to your application, simply press the Esc key. If you're two or more menus deep, you will have to hit the Esc key twice.

You can download a ready-to-run copy of TRACKR.COM, its assembly language source code, and the customization file (TRACKR.ZIF) that allows you to change its default pop-up key and color scheme from PC MagNet, as explained in the sidebar, "Downloading Utilities." If you don't have a modem, the source code is available by mail or fax: Just send a postcard with your name and address (or fax number if applicable) to the attention of Katherine West, *PC Magazine*, One Park Avenue, New York, NY 10016. Bear in mind that if you do modify the source code you will need to reassemble it, using a Microsoft Macro Assembler, Version 5.0 or later, or its equivalent.

YOUR CLIENT FILE

You can use any ASCII editor—DOS 5.0's EDIT, *PC Magazine*'s TED, or even your word processor (in its nondocument mode)—to create CLIENT.DAT, the file that holds the billing information for each of your accounts. A typical entry in CLIENT.DAT might be

If You Bill Clients by The Hour, TRACKR Can Simplify Your Life

■ This handy utility keeps track of the time you spend on each project, multiplies it by your hourly rate, and even writes up your bill.

ABC Incorporated
123 Anystreet
Anytown, AK 55555
(206) 555-1212
\\95\\15

After the line containing the client name, you can include any number of additional lines (each terminated by pressing Enter) that you want TRACKR to print out in its billing report. In the above sample, for instance, you might want to add an account number code for the client, or you might decide you don't want to include the phone number on the invoice. Anything between the client's name and the last line of each client entry is optional.

The last line in each client entry is the only one that must follow a specific format: \\\$\$\$\\num, where \$\$\$ is the rate at which you bill this client per hour, and num is the minimum billing increment in minutes. The last line in the sample entry above, therefore, tells TRACKR that you bill ABC Incorporated at \$95 per hour and that partial-hour calculations should be rounded up to the next 15 minutes. Note that the billing rate and increment line must be the only line whose first

nonspace character is a backslash.

Your CLIENT.DAT file will hold the multiline entries for up to 30 clients, and entries can be separated by blank lines or not, as you choose. If you put more than 30 clients in your CLIENT.DAT file, TRACKR will notify you with the message, "Ignoring Extra Clients." You can either continue (but not have access to all your clients) or uninstall TRACKR, edit your CLIENT.DAT file down to 30 clients, and run TRACKR again.

USING TRACKR

When you have created your CLIENT.DAT file, you're ready to install TRACKR. You can do this simply by running it, either from the DOS prompt or as a line in your AUTOEXEC.BAT file. The full syntax for TRACKR is

```
TRACKR [/n] [/O] [/I d:\path]
```

By default, TRACKR creates its .LOG files (your billing reports) in the same directory where it and your CLIENT.DAT file are located. If you want to keep TRACKR.COM itself in another subdirectory (for example, if you put all your utilities in the \UTIL subdirectory listed on your PATH), then the first time you run TRACKR you must use the /I command line option to tell it where to find CLIENT.DAT. For example, if you want your log reports kept in the C:\BILLING subdirectory, then move CLIENT.DAT into that subdirectory and start TRACKR with the following line:

```
TRACKR /I C:\BILLING
```


TRACKR will thereafter remember where you keep its ancillary files, so you need use the /I switch only once.

When you're logged onto a task, TRACKR periodically displays the name of the active task and the elapsed time (in hh:mm) since you started it. This reminder appears in the upper-right corner of your screen for 5 seconds, and by default it is repeated once a minute. You can disable the reminder or change how often it appears by using the /n command line switch when you install TRACKR. The n value is the number of minutes that should elapse between reminders, and it can range from 0 (no reminder) through 9. When in Pause mode (described below), the reminder pops up as before, except that instead of displaying elapsed task time it reminds you that you're in Pause mode.

The /U command line switch allows you to uninstall TRACKR from memory, subject to the usual limitation that TSRs must be uninstalled in the reverse order in which they were loaded. If at any time you forget the command syntax, simply enter TRACKR /?.

Once loaded, TRACKR pops up when you press Ctrl-R. Both the default hotkey and the colors used by the TRACKR menus can be changed with PATCH (Utilities, November 12, 1991) and the TRACKR.ZIF configuration file. Any time you are in a TRACKR menu and wish to return to your application, simply press Esc.

TRACKR can pop up only in text modes. Thus, if you need to access the utility while running a program that uses graphics modes, you must get to a part of the program that uses text mode before the

hotkey will have any effect. If necessary, you can go out to the DOS prompt, using the application's "shell" function. Only in the worst case might you temporarily have to exit the application.

The first time you use TRACKR, it will notice that you haven't created any tasks to be timed for any of the clients listed in your CLIENT.DAT file. TRACKR will therefore simply present you with a list of the clients. (Only the first 21 characters of each client's name will be shown.) When you select a client, you'll be asked to provide a Task Name.

The Task Name can be 8 characters long and must not contain anything that cannot be part of a legal DOS filename. (TRACKR will append the extension .LOG to the Task Name, and this combination becomes the filename of the billing report.) When you type in the desired Task Name and hit Enter, TRACKR will prompt you for a comment, which can be up to 30 characters and is designed for short notes or identifiers such as "First Qtr State Tax Return."

Whether you include a comment or not, hit Enter once again. You will be returned to the application in which you were working (or to DOS, if you shelled out), and TRACKR will start the meter on the task you have just created for the selected client.

TRACKR MENUS

If you now hit Ctrl-R again, the task you just created (along with others, as your task list grows) will appear on the left side of the menu window. On the right

side are five menu choices: Pause, Log Off, Switch, Create New Task, and Update Task Log. Press the highlighted letter to select the desired function, or press Esc to return to your application.

If you're interrupted during a task and want to suspend billing time during the interruption, press P for Pause. That way you don't have to log off and then relog onto the same task later. When you want to resume, press Ctrl-R to get to the menu and hit R for Resume.

Press L from the menu to Log Off the currently active task. TRACKR will then stop charging time to the active task, write the time information to that task's log

You can return to your application from any TRACKR menu simply by pressing Esc.

file, and recalculate the billing entries in that task's log file.

Pressing S (for Switch) provides a shortcut option that logs you off the current task and immediately logs you onto another. This is particularly handy when you're working on one project and get a billable telephone call for another client. Note that each available task is identified in the menu by both name and number; when switching tasks, you enter the number of the new task.

To create a new task, you press C for Create Task at the menu. This will initially bring up an alphabetical list of all the clients from the CLIENT.DAT file, displayed on the left side of the pop-up window. Since TRACKR can only display five clients at a time, you may need to use the PgUp and PgDn keys to go through the entire list. Select the client to be billed (again, by number), and you'll be asked to provide a Task Name (remember, it can only be 8 characters). You'll again have the option of entering a comment. Once you press Enter, TRACKR logs you onto the new task and returns you to your application.

Over time, you will probably create more tasks than the 10 that can be displayed at once in the menu window. The PgUp and PgDn keys will again take you

A SAMPLE LOG FILE

```

ABC Incorporated                ;data taken from CLIENT.DAT file
123 Anystreet
Anytown, AK 55555
(206) 555-1212
\95\15                          ;billing rate and billing increment

[date] [LogIn] [LogOut] [Total in billing increments] << not in report
09/19/91 07:33 07:37 00:15 2nd qtr state taxes ;comments
          07:50 11:30 03:45
*      Day Total: 04:00      $ 380.00 ;day total in billing increments

10/01/91 08:50 09:32 00:45 Sep 91 payroll
          10:02 11:23 01:30
          13:15 14:32 01:30 Estimated November taxes
*      Day Total: 03:45      $ 356.25

===== Task Total: 07:45      $ 736.25 ;grand totals

```

Figure 1: TRACKR report (.LOG) files are editable with an ordinary ASCII editor. Do not change amounts in the totals fields, however, or your changes will be overridden the next time the program updates the file.

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Set your communications software to 300, 1,200, or 2,400 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex.

Dial the local number. When you connect, type Ctrl-C. At the HOST NAME prompt, type CIS. At the USER ID prompt, type 177000,5000. At the PASSWORD prompt, type PC*MAGNET. At the ENTER AGREEMENT NUMBER prompt, type Z11D9200.

Register your name and enter your

MasterCard, Visa, or American Express card number. (If you'd like to have your company billed instead, call CompuServe at 800-848-8990.)

Your personal user ID and password will be displayed at the end of the registration process. Record them for logging on over the next few days; a new password will arrive in the mail within ten days to confirm your subscription.

There are no up-front subscription charges; you pay only for the time you spend on-line. CompuServe members can join by entering GO PCMAG at any CompuServe "!" prompt. CompuServe Customer Service can be reached at 800-848-8990. Outside the United States, call 614-457-8650.

PC MagNet costs \$12.80 an hour for 1,200- or 2,400-bps service, or \$6.30 an hour for 300-bps service. Billing is based on 1-minute increments. ■

through the entire list, which is limited to a total of 50 tasks (.LOG files). If you create more than 50 tasks, TRACKR will warn you when you load it into memory.

Since all the tasks you create are listed alphabetically rather than being grouped by client, you may want to include a client code in every Task Name. For example, you may want to have a Phone Task for each client so that when he calls you can immediately start tracking the amount of time you're on the phone with him. Thus, if you have three clients—ABC Corp., XYZ Corp., and PC Corp.—you might have Task Names of ABCPHON, XYZPHON, and PCPHON.

As mentioned earlier, TRACKR takes a Task Name, such as "proposal," and creates a PROPOSAL.LOG file from it. The .LOG file for each task contains the client information entered in the CLIENT.DAT file, plus an entry for each time you start the task. Each entry consists of the date, the time you began the task, the time you stopped the task, the time spent on the task, and any comments you entered in the comment field. The file also tallies the time totals for each

day and multiplies these by the billing rate, thus coming up with a billable amount for each day. The last entry in the .LOG file is the total amount of time spent and money due for the entire task. A sample log file is shown in Figure 1.

If you want to update the calculations without leaving the task, you simply hit U for Update a task, which is the final selection from the menu. Note that when TRACKR calculates the time you spent working on a task, it always rounds up to the next billing increment: If you work on a particular task for 16 minutes and you bill in 15-minute intervals, TRACKR will bill for 30 minutes. Since the log file shows the actual log-on and log-off times, you may occasionally want to adjust the log-off time shown in the file to avoid overcharging. TRACKR will update the calculations, based on the corrected time, the next time you perform the task or use the Update function.

Rounding up to the next billing increment can cause similar confusion when you encounter a series of interruptions and are using the Pause feature. Each time you resume, a new entry is started,

and rounding up a series of short fractional increments can plainly result in overcharging. One solution is to bill in smaller minute increments (down to 1 minute), but again there will be times when you want to edit the file and update it before printing it for your client.

You can use any ASCII editor to edit a .LOG file and delete, add, or adjust any entry. When editing, be sure to keep the columns lined up, and use spaces (not tabs) to keep everything in line. Note, however, that when TRACKR updates a .LOG file, it pays attention only to the date, start time, end time, and comment fields. If you need to adjust a total, therefore, *you must do so by adjusting the start or end times*. TRACKR's recalculations will wipe out any editing changes you make in a total field. You can, however, edit the client information shown in the .LOG file, including billing rate and billing increments, and these changes will be reflected at the next update.

When the .LOG file is finalized, you can use your word processor, any print utility, or the DOS command

```
TYPE filename > PRN
```

to print out the billing report.

When no task is currently being metered, pressing Ctrl-R brings up a menu with only three choices on the right side of the menu: Create new task, Update task log, and Log in new task. Only the L (for Log in) option is new here, and the procedure is familiar. After pressing L, you select the desired task from the list by entering its number rather than its name and then by entering a comment, if desired. TRACKR will immediately return you to your application and start tracking your time on this task.

Two final notes are in order. You must always load TRACKR before you load Microsoft Windows. If TRACKR still doesn't pop up in the application you're running under Windows, then open the DOS window in the Main folder and pop it up from there. Note also that you may have to install TRACKR before you open other DOS applications. If you shell out from a program and try to load TRACKR, you may not be able to get it to pop up within the application.

Scott Chaney is the founder of RSE, a company in Auburn, Washington, that specializes in the development of productivity shareware for PCs. ■

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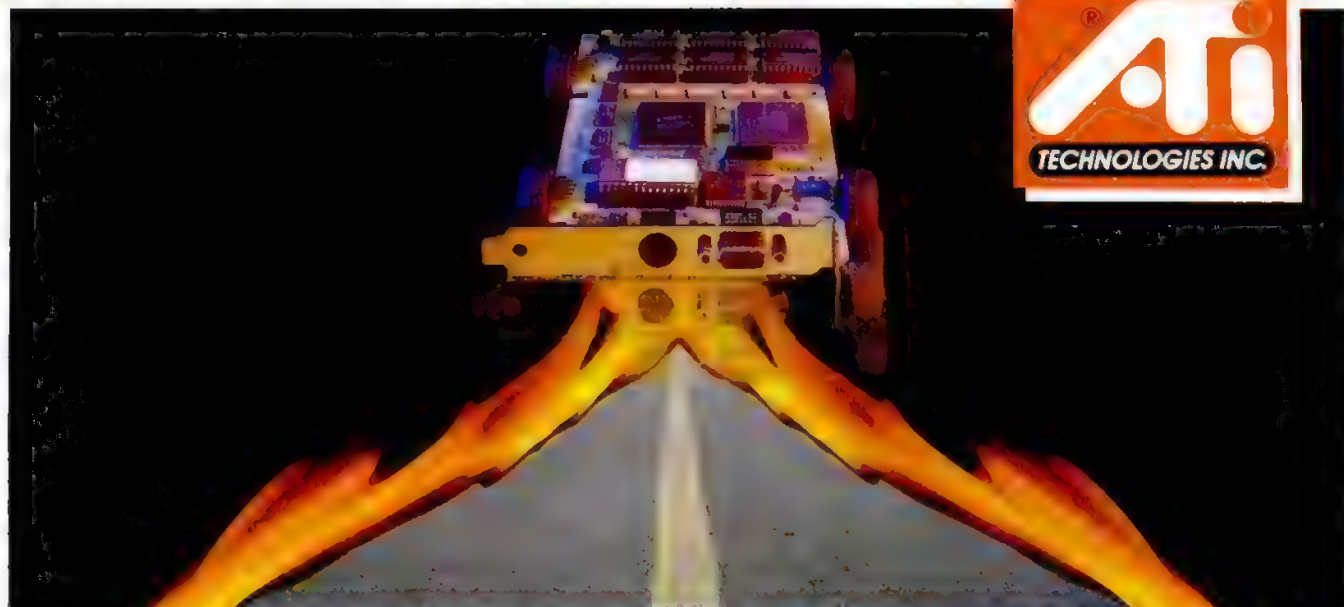
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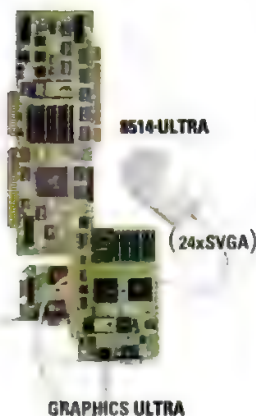
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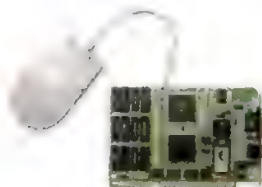
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by
Neil J. Rubenking

Lab Notes

Windows programming was once a daunting discipline undertaken only by hardy C programmers and an occasional assembler buff. Would-be adepts were discouraged to find that a simple "Hello, World!" program for Windows might take 100 lines of code. They then faced the need to memorize a stupefying list of Windows API (application program interface) functions such as UnhookWindowHook, AllocDStoCSAlias, and GetMenu-CheckMarkDimensions. Adding insult to injury, prospective Windows programmers had to pay dearly for the Windows SDK (Software Development Kit) even to be able to use these functions.

Fortunately, those grim days are now past, thanks to Turbo Pascal for Windows (TPWin). TPWin can access all the Windows API functions without the SDK, and its WinCrt Unit lets you recompile very simple Turbo Pascal programs almost unchanged under Windows. TPWin's most outstanding contribution to Windows programming, however, is OWL, the Object Windows Library, which will be used by the programs and program templates to be presented in this Lab Notes.

OWL is a collection of *objects* designed to mesh perfectly with the Win-

Now You Can Program Windows with Turbo Pascal for Windows

■ New resources and the program templates and examples presented here move Windows programming beyond the realm of C and assembly language.

dows interface elements that make up the visible portion of any Windows program. OWL is similar to Turbo Pascal 6.0's *Turbo Vision* application framework, except that the latter uses its own proprietary event-driven windowed interface while OWL ties directly into the existing Windows interface. OWL takes care of all the

activity that's the same for every Windows program, leaving you free to concentrate on all of your program's special features.

With TPWin, Borland supplies White-water Resource Toolkit (WRT), a program that lets you *visually* create and edit all the interface items necessary to a Windows program: menus, icons, dialog boxes, buttons, and scrollbars. The items created with WRT are stored in *resource files*, and most OWL objects can link directly with these items. (When writing programs for OWL, you'll find that a good part of your "programming" time will be spent in defining resources.) For a small additional fee, TPWin owners can purchase Borland's own Resource Workshop (RW), an even better resource editor that seems likely to replace WRT in the next major

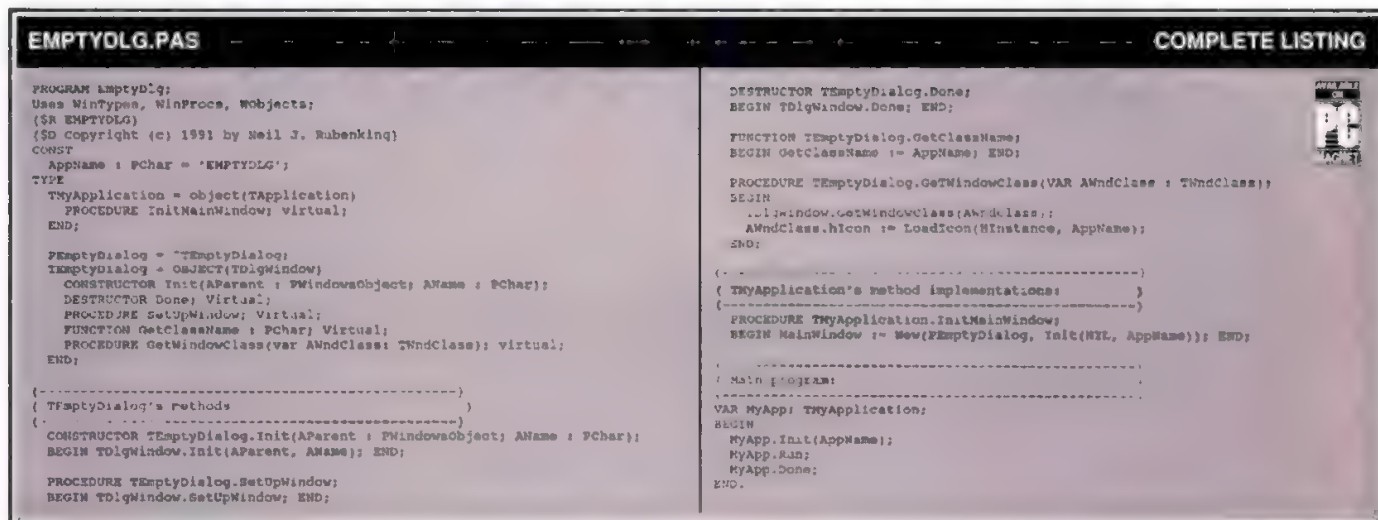


Figure 1: This program is a bare-bones template for a TPWin program whose main window is a dialog box.

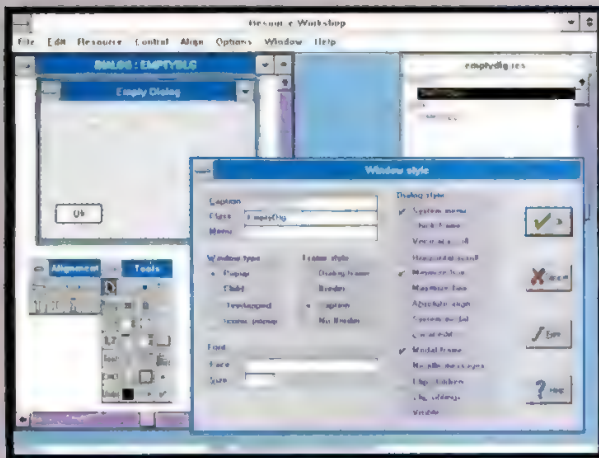


Figure 2: Setting the class of this dialog box to EmptyDlg associates it with the main window in EMPTYDLG.PAS (Figure 1).

revision of the TPWin package. In preparing this article, I've used Resource Workshop, but have avoided features that are unavailable in WRT.

Nearly every Windows program comes up as a *main window*. Sometimes this window has *child windows* inside it, and often it's variable in size. At other times the main window has the more formal structure of a dialog box, with check boxes, buttons, list boxes, and other user interface controls. For simple utilities requiring a fixed set of inputs, it makes sense to base your OWL program on a TDialog object. More complex programs should be based on a TWindow object.

Every OWL program of the same main window type shares certain features with every program of that type, and OWL is designed to handle the repeated, mundane aspects of Windows programming. For this Lab Notes, therefore, I've created two Pascal program templates—one for dialog-based programs, the other for window-based applications. For each of the templates I've also included a sample program. Using the templates will give you a fast start on new programs.

DIALOG-BOX-BASED PROGRAMS

Many Windows utilities take information from the user and act on it, using a simple fixed-size dialog box. Richard Hale Shaw's WINCOLOR utility (Utilities, August 1991) is a good example. Such a program usually has no menu, and interacts with the user via buttons, scrollbars, edit lines, check boxes, and other standard dialog box controls instead.

In almost any dialog-based program, there are certain methods you'll want to override; the program EMPTYDLG.PAS, shown in Figure 1, implements exactly these methods.

In maintaining the connection between the TPWin program and its resource, it's handy to use the same name wherever possible. I always use the program's name for the program filename, the resource filename, and the value of the constant AppName. In the resource, I always name the most important instance of each resource type with this name as well. While this style isn't required, it does save a lot of effort.

This naming convention is at work in the first few lines of EMPTYDLG.PAS.

The program name is EmptyDlg, the resource file, linked by the \$R line, is EMPTYDLG, and the constant AppName has the value 'EmptyDlg'. In examining the code in Figure 1 you should note the \$D line under the USES clause. \$D stands for Description: Text that you put on this line will be embedded in your program. You'll obviously want to personalize this line.

The program defines TEmptyDialog (descended from TDlgWindow), and it overrides the Constructor, the Destructor, and the SetUpWindow, GetClassName, and GetWindowClass methods. In this do-nothing template, the methods Init, Done, and SetUpWindow don't actually add any new processing to the method inherited from TDlgWindow; a real program will add code to one or more of these methods. The GetClassName function overrides the TDlgWindow function to make your program name the class name, and the GetWindowClass associates the icon named EmptyDlg with TEmptyDialog objects. Both the icon and the main dialog box reside in the resource file.

Figure 2 shows Resource Workshop's dialog editor with the main dialog box loaded into it. The dialog's Class field contains EmptyDlg, for this field must match the AppName constant. By default, a new dialog box in Resource Workshop has only the System Menu and Modal Frame style options checked; the EmptyDlg box also has Minimize Box checked. Without this option, you would not be able to minimize the resulting program to an icon.

The EmptyDlg dialog box contains an Ok button and a Cancel button (not visible in Figure 2). I included these because the vast majority of programs use at least one or the other, and they're easy enough to delete if unnecessary. They're set up to return the special identifiers IDOK and IDCANCEL, which are predefined in RW and automatically processed by OWL. You can use named identifiers only when editing a resource script (*.RC) file; if

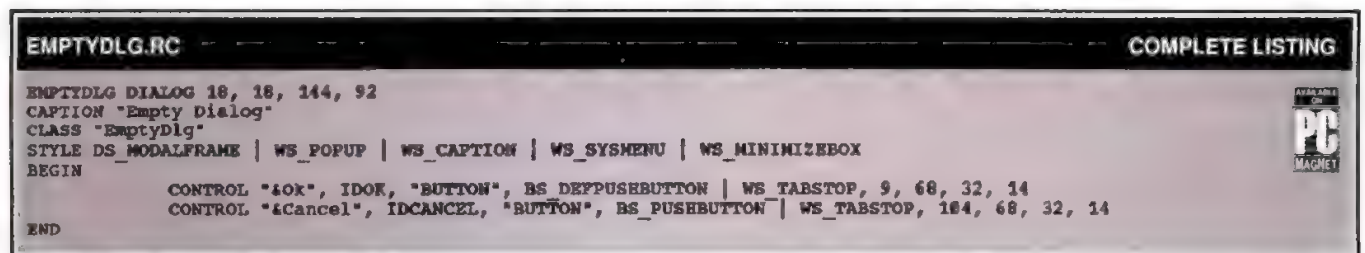


Figure 3: This resource script describes the dialog box seen in Figure 2 in script form.

SELECTO.PAS

COMPLETE LISTING

```

PROGRAM Selecto;
($R Selecto)
($D Copyright (c) 1991 by Neil J. Rubenking)
Uses Wintypes, WinProcs, Mobjects;
CONST
  AppName : PChar = 'Selecto';
CONST
  id_Lb1   = 101;
  id_Lb2   = 102;
  id_SelBtn = 103;
  id_RejBtn = 104;
TYPE
  TMyApplication = object(TApplication)
    procedure InitMainWindow; virtual;
  end;

PSelDialog = TselDialog;
TselDialog = OBJECT(TDlgWindow)
  LB1, LB2 : TListBox;
  IsMult : Boolean;
  CONSTRUCTOR Init(AParent : TWindowsObject; AName : PChar);
  DESTRUCTOR Done; virtual;
  PROCEDURE SetupWindow; virtual;
  FUNCTION GetClassName : PChar; virtual;
  PROCEDURE GetWindowClass(var AWndClass : TWndClass); virtual;
  PROCEDURE IDLB1(VAR Msg : TMessage); Virtual id_First + id_Lb1;
  PROCEDURE IDLB2(VAR Msg : TMessage); Virtual id_First + id_Lb2;
  PROCEDURE IDSelBtn(VAR Msg : TMessage); Virtual id_First + id_SelBtn;
  PROCEDURE IDRejBtn(VAR Msg : TMessage); Virtual id_First + id_RejBtn;
  PROCEDURE TransSelect(L1, L2 : TListBox);
END;

{-----}
{ TselDialog's methods }
{-----}
CONSTRUCTOR TselDialog.Init(AParent : TWindowsObject; AName : PChar);
BEGIN
  TDlgWindow.Init(AParent, AName);
  New(LB1, InitResource(0Self, id_Lb1));
  New(LB2, InitResource(0Self, id_Lb2));
END;

PROCEDURE TselDialog.SetupWindow;
VAR
  N : LongInt;
  mul2 : Boolean;
  Name : ARRAY[0..20] OF Char;
BEGIN
  TDlgWindow.SetupWindow;
  N := GetWindowLong(LB1^.hWindow, gwL_style);
  IsMult := (N AND lbs_MultipleSel) <> 0;
  N := GetWindowLong(LB2^.hWindow, gwL_style);
  mul2 := (N AND lbs_MultipleSel) <> 0;
  IF IsMult XOR mul2 THEN
    BEGIN
      MessageBox(hWindow, 'BOTH listboxes must be '+
        'multiple, or NEITHER!',
        'ERROR IN RESOURCE', mb_ok + mb_iconHand);
      Exit;
    END;
  N := 1;
  WHILE LoadString(hInstance, N, Name, 20) <> 0 DO
    BEGIN
      LB1^.AddString(Name);
      Inc(N);
    END;
  EnableWindow(GetItemHandle(id_RejBtn), FALSE);
END;

DESTRUCTOR TselDialog.Done;
BEGIN TDlgWindow.Done; END;

FUNCTION TselDialog.GetClassName;
BEGIN GetClassName := AppName; END;

PROCEDURE TselDialog.GetWindowClass(VAR AWndClass : TWndClass);
BEGIN
  TDlgWindow.GetWindowClass(AWndClass);
  AWndClass.hIcon := LoadIcon(hInstance, AppName);
END;

PROCEDURE TselDialog.IDLB1(VAR Msg : TMessage);
BEGIN
  CASE Msg.lParamHi OF
    lbn_DblClk : IF NOT IsMult THEN TransSelect(LB1, LB2);
    lbn_SetFocus : BEGIN
      EnableWindow(GetItemHandle(id_SelBtn), TRUE);
      EnableWindow(GetItemHandle(id_RejBtn), FALSE);
    END;
    ELSE DefNotificationProc(Msg);
  END;
END;

PROCEDURE TselDialog.IDLB2(VAR Msg : TMessage);
BEGIN
  CASE Msg.lParamHi OF
    lbn_DblClk : IF NOT IsMult THEN TransSelect(LB2, LB1);
    lbn_SetFocus : BEGIN
      EnableWindow(GetItemHandle(id_RejBtn), TRUE);
      EnableWindow(GetItemHandle(id_SelBtn), FALSE);
    END;
    ELSE DefNotificationProc(Msg);
  END;
END;

PROCEDURE TselDialog.TransSelect(L1, L2 : TListBox);
TYPE SelBuff = ARRAY[1..32760] OF Integer;
VAR
  Num, M : Integer;
  Name : ARRAY[0..20] OF Char;
  Sels : 'SelBuff';
BEGIN
  IF IsMult THEN
    BEGIN
      Num := SendDlgItemMsg(L1^.GetID,
        lb_GetSelCount, 0, 0);
      IF Num > 0 THEN
        BEGIN
          GetMem(Sels, Num*2);
          Num := SendDlgItemMsg(L1^.GetID,
            lb_GetSelItems, 20, LongInt(Sels));
          FOR M := Num DOWNTO 1 DO
            BEGIN
              L1^.GetString(Name, Sels[M]);
              L2^.AddString(Name);
              L1^.DeleteString(Sels[M]);
            END;
          FreeMem(Sels, Num*2);
        END;
      END;
    END;
  ELSE
    BEGIN
      N := L1^.GetSel_Index;
      IF (N >= 0) AND (N <= L1^.GetCount) THEN
        BEGIN
          L1^.GetSelString(Name, 20);
          L2^.AddString(Name);
          L1^.DeleteString(N);
        END;
      END;
    END;
END;

PROCEDURE TselDialog.IDSelBtn(VAR Msg : TMessage);
BEGIN TransSelect(LB1, LB2); END;

PROCEDURE TselDialog.IDRejBtn(VAR Msg : TMessage);
BEGIN TransSelect(LB2, LB1); END;

{-----}
{ TMyApplication's method implementations }
{-----}
PROCEDURE TMyApplication.InitMainWindow;
BEGIN MainWindow := New(PSelDialog, Init(NIL, AppName)); END;

{-----}
{ Main program }
{-----}
VAR MyApp : TMyApplication;
BEGIN
  MyApp.Init(AppName);
  MyApp.Run;
  MyApp.Done;
END.

```

Figure 4: The program SELECTO.PAS was built using EMPTYDLG.PAS as a framework. The program itself doesn't have a specific purpose; however, the technique will save you considerable programming time and effort.

you load the corresponding .RES file, the identifier names will be replaced by their values.

Another important virtue of .RC files is that they give you an overview of the entire resource. Although WRT can't load .RC files, both RW and WRT let you save resources in .RC form. Figure 3 shows the EmptyDlg dialog box in its

resource script form.

The program EmptyDlg defines one other object: a descendant of the basic TApplication object whose sole purpose is to load an instance of TEmptyDialog as the main window of the application. A simple overridden InitMainWindow method handles that task. Finally, the main body of the program takes an instance of

this TApplication descendant and calls three of its methods, Init, Run, and Done. That's the main program—those three simple lines.

When you run the EmptyDlg program, you'll see a dialog box with Ok and Cancel buttons in it. When you minimize it, you'll see a white icon with empty dlg written on it. Clicking on either button ends the

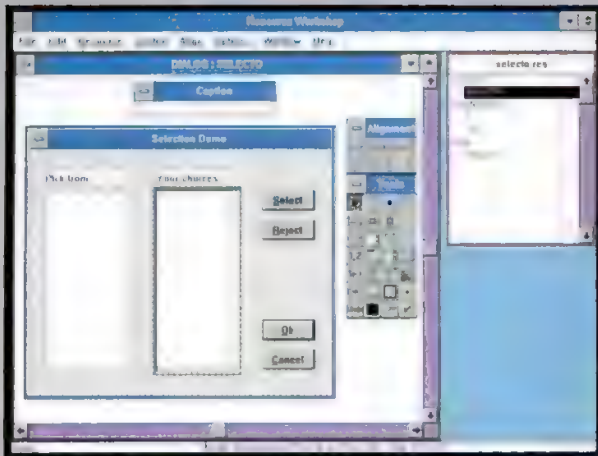


Figure 5: The dialog box in SELECTO.RES began as a copy of EMPTYDLG .RES. Although the Ok and Cancel buttons are still present, several new controls have been added.

program. Building on this template will give you a head start on any dialog-based program.

BUILDING A SELECTION LIST

To illustrate the EmptyDlg template in use, I've written a simple program that lets the user collect a group of strings by selecting them from a list box. The program itself doesn't do anything useful, but the *technique* is one I've often seen requested in Borland's BPROGA Forum on CompuServe.

The process of building a new program based on the EmptyDlg template always starts the same way. First, load EMPTYDLG.PAS into TPWin and save it under a new name—in this case SELECTO.PAS, which is shown in Figure 4. Now replace every instance of "EmptyDlg" with the new program name. You may also want to rename the TEmptyDialog object; in this example it becomes TSelDialog.

Next, bring up EMPTYDLG.RES in your resource editor and save it, again using the new name. Put the highlight bar on the dialog box and use ResourceRename to give it the new name. Do the same with the icon. Finally, enter the dialog editor, double-click on the dialog box itself, and change the class name field to reflect the new name. You may also want to edit the icon at this point.

Figure 5 shows the main dialog box for SELECTO.RES. It contains two list boxes, four buttons, and a couple of static text items. To the Ok and Cancel buttons have been added the new Select and Reject buttons. Again, it's easier to see the entirety of the dialog resource when it's put in script form, as in Figure 6. In addition to the usual main dialog box and icon, this file contains a string table resource. As its name implies, this is a list of strings—in this case, 26 names.

The TDlgWindow descendant in SELECTO.PAS includes the same five

methods defined in EMPTYDLG, plus three data fields and five more methods. Fields LB1 and LB2 are of type PListBox and are pointers to the OWL object TListBox. It's important to realize that what you see on-screen is *not* a TListBox. Rather, it's a Windows data structure called a list box that may or may not be associated with a corresponding TListBox object. This program will associate each list box with a TListBox.

Four of the added methods are *message response methods*, that is, methods that respond to windows' messages. They are also *dynamic methods*: virtual methods that are accessed via the DMT (Dynamic Method Table) rather than via the VMT (Virtual Method Table). A VMT is an array that contains the address of *every* virtual method defined or inherited by an object. A DMT contains only the addresses of dynamic methods overridden in an object. Windows-related objects potentially have hundreds of virtual methods, so using dynamic methods instead can result in real memory savings. The OWL objects are responsible for translating Windows messages into calls to these particular dynamic methods.

ANALYZING SELECTO

I'll begin with the five methods that SELECTO.PAS "inherited" from the generic EMPTYDLG.PAS. The Init constructor links the two PListBox objects with the two list boxes in the main dialog box. The constants id_lb1 and id_lb2, found in SELECTO.INC, serve to identify which goes with which. These values *must* match the ID numbers you used for the list box controls in Resource Workshop. This is easily checked, since TPWin and RW can be on-screen simultaneously.

The new SetUpWindow method checks to see exactly what kind of list boxes you've used. It calls the GetWindowLong API function on each list box, using the

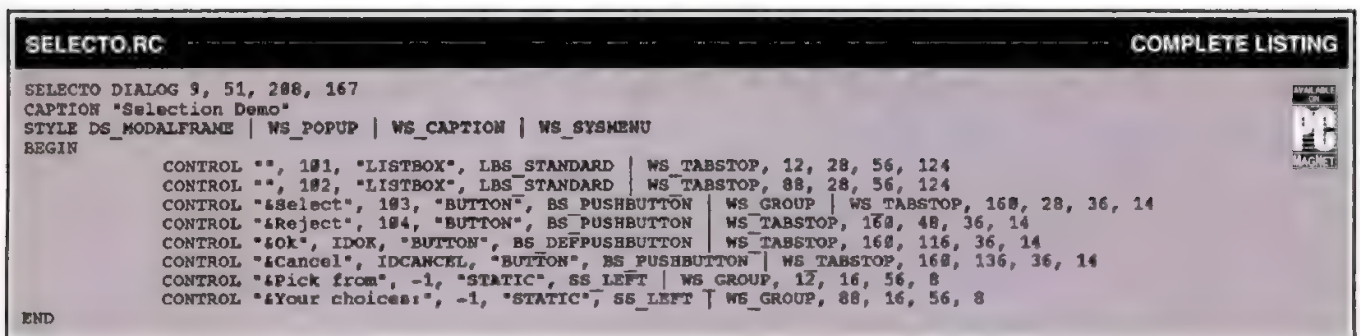


Figure 6: This is the script version of the SELECTO dialog box shown in Figure 5. You'll find it is often easier to edit a resource in script form.

Now your soft fonts will be ready and waiting for you...

A yawn... A long, heavy sigh. Once again you're ready to print but your soft fonts aren't. Because somewhere in the realm between your computer and LaserJet® printer they're slowly downloading. So you wait.

...instead of the other way around.

At Pacific Data Products we know that to get soft fonts that are easy to use and don't require downloading you need a special type of printer cartridge. That's why we've created the **FontBank Cartridge™** for the HP LaserJet Series II and III family of printers.

The **FontBank Cartridge** contains a new kind of memory where you can store your favorite soft fonts and printer macros. Unlike your printer's memory, it retains information even when the printer is turned off. So once you've downloaded, you'll never need to download again. And you'll know exactly which fonts and macros are residing at your printer. No more guessing. No more surprises. You can even add or delete fonts as often as you wish.

The **FontBank Cartridge** comes with printer drivers for Word® 5 and 5.5, WordPerfect® 5.1, and Windows® 2.X and 3.0. And it's compatible with bitmapped soft fonts that adhere 100% to HP® standards including those from Bitstream®, Agfa®, and Hewlett-Packard, as well as HP PCL printer macros for logos, letterheads, and forms. With the LaserJet III, IIID, or IIIP printer, PCL5 scalable fonts can also be used. The **FontBank Cartridge** requires no extra printer memory and has a list price of only \$299 for the 3/4 MB version and \$399 for the 1.5 MB version.

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index `gwl_Style`. The result is a `LongInt` that encodes a number of list box style elements. What the program needs to know is whether the list box allows multiple selection; if so, the bit corresponding to the constant `lbs_MultipleSel` will be set. It may seem odd that the program has to ask what kind of list boxes it contains, but as you'll see, you can *change* the list boxes inside the .EXE file with the Resource Editor. So, `SetUpWindow` determines whether the list boxes are multiple choice or not, noting the result in the object's `IsMult` field.

The `SetUpWindow` method also pulls the names from the resource and inserts them into the first list box. API function `LoadString` extracts a string from a resource and returns the string length (zero if the string doesn't exist). There were exactly 26 strings in the original resource, but to be safe the routine simply keeps reading until `LoadString` returns 0. It also disables the Reject button, using the API function `EnableWindow`. Methods `GetClassName`, `GetWindowClass`, and `Done` are unchanged from the previous example.

Note that some of the initialization happens in the Constructor and the rest in `SetUpWindow`. The reason is that at the time the Constructor is called, the OWL object is ready for use but the corresponding Windows item is not. The all-important `hWindow` window handle does not yet refer to the window. Any initialization that requires a valid `hWindow` *must* take place in `SetUpWindow`.

The next two methods respond to

messages from the first and second list boxes, respectively. A list box sends a number of notification messages to its parent dialog box, and `SELECTO.EXE` responds any time one of its list boxes gets the focus or the user double-clicks on it. Double-clicking on one of these list boxes triggers a call to transfer the selected item *if* the list box is single-choice.

The **SELECTO** program
isn't intended to do
useful work; the
techniques explored in
creating it are what's
important.

When the first list box gets the focus, it enables the Select button and disables the Reject button. The second list box does the opposite.

The `TransSelect` method, which transfers selected items from one list box to the other, uses OWL methods wherever possible. For single-choice dialog boxes, no API calls are needed; the method simply gets the selected string from one `TList-`

Box, inserts it in the other, and deletes it from the first. However, a few specialized Windows messages ease the process for a multiple-choice dialog box. Thus, sending the message `lbs_GetSelCount` to the list box obtains the number of selected items. After a buffer with enough memory to hold the required number of items has been allocated, the message `lbs_GetSelItems` fills the buffer with the positions of the selected items. `TransSelect` can then use OWL methods to transfer those items.

The remaining two message response methods are tiny. `IDSelButn`, called when you click on the Select button, transfers selected items from the first list box to the second. `IDRejButn`, called by a click on the Reject button, does the opposite.

RUNNING THE SELECTO PROGRAM

If you now compile and run `SELECTO.PAS`, you'll see that you can select an item in one list box with the keyboard or mouse and transfer it to the other by double-clicking, clicking on the appropriate button, or pressing the underlined key on the appropriate button. Most of the behavior of the dialog box controls is handled by Windows, some of it by OWL, and the bare minimum by your program.

The `TransSelect` method can handle multiple-choice list boxes, but initially the list boxes are restricted to single choices. This provides an opportunity to demonstrate an amazing property of the resource editor. Bring up either WRT or RW and load `SELECTO.EXE`—*not* `SELECTO`

EMPTYWIN.PAS

COMPLETE LISTING

```
PROGRAM EmptyWin;
Uses WinTypes, WinProcs, WObjects;
($R EMPTYWIN)
($D Copyright (c) 1991 by Neil J. Rubenking);
CONST
  AppName : PChar = 'EmptyWin';
TYPE
  TMyApplication = object(TApplication)
    PROCEDURE InitMainWindow; virtual;
  END;

  TTestWindow = TTestWindow;
  TTestWindow = OBJECT(TWindow)
    CONSTRUCTOR Init(AParent : PWindowsObject; AName : PChar);
    DESTRUCTOR Done; virtual;
    PROCEDURE SetUpWindow; virtual;
    FUNCTION GetClassName : PChar; virtual;
    PROCEDURE GetWindowClass(VAR AWndClass: TWndClass); virtual;
    PROCEDURE Paint(pDC : hDC; VAR PS : TPaintStruct); virtual;
  END;

  {-----}
  { TTestWindow's methods }
  {-----}
  CONSTRUCTOR TTestWindow.Init(AParent : PWindowsObject; AName : PChar);
  BEGIN
    TWindow.Init(AParent, AName);
    Attr.Menu := LoadMenu(hInstance, AppName);
  END;

  PROCEDURE TTestWindow.SetUpWindow;
  BEGIN TWindow.SetUpWindow; END;
```

```
DESTRUCTOR TTestWindow.Done;
BEGIN TWindow.Done; END;

FUNCTION TTestWindow.GetClassName;
BEGIN GetClassName := AppName; END;

PROCEDURE TTestWindow.GetWindowClass(VAR AWndClass :
  TWndClass);
BEGIN
  TWindow.GetWindowClass(AWndClass);
  AWndClass.hIcon := LoadIcon(hInstance, AppName);
END;

PROCEDURE TTestWindow.Paint(pDC : hDC; VAR PS : TPaintStruct);
BEGIN TWindow.Paint(pDC, PS); END;

{-----}
{ TMyApplication's method implementations: }
{-----}
PROCEDURE TMyApplication.InitMainWindow;
BEGIN MainWindow := New(TTestWindow, Init(nil, AppName)); END;

{-----}
{ Main program: }
{-----}
VAR MyApp: TMyApplication;
BEGIN
  MyApp.Init(AppName);
  MyApp.Run;
  MyApp.Done;
END.
```



Figure 7: This program serves as a template for building programs whose main window is a `TWindow` object.

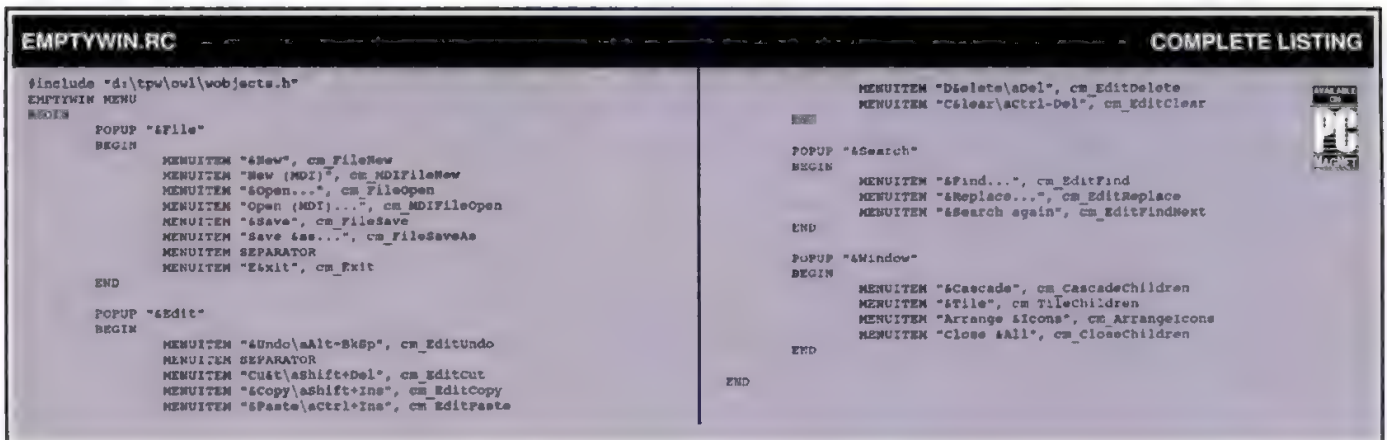


Figure 8: The EMPTYWIN (Figure 7) menu, shown here in script form, implements all the standard OWL menu choices. Because it includes WOBJECTS.H, it can refer to them directly by name.

.RES—into it. You'll find that you have complete access to the program's resources. Bring up the dialog box and double-click on the first list box, then check the "Multiple Select" check box. Do the same for the other list box. You may want to change the list of names, as well. In any event, now save your changes.

Without recompiling the Pascal source code, run SELECTO.EXE. At this point each click on a list box item will toggle that item's selection state, and a click on the Select or Reject button will transfer *all* selected items to the other list box. You've made an important change to the program's operation without touching the source code!

The SELECTO program isn't itself intended to do useful work; it's merely a teaching program. The techniques explored

here in creating it are what's important. You'll go through much the same process each time you base a program on the EmptyDlg template. You'll hook up OWL objects to some of your dialog box's controls in the Init Constructor and send messages to them in the SetUpWindow method. You'll write custom message response methods to deal with messages from those controls. And, as sparingly as possible, you'll use Windows API calls to perform actions that the basic OWL objects themselves don't implement.

WINDOW-BASED PROGRAMS

If your application needs a resizable window, a window with a scrolling interior, a window that the user can write or paint upon, or multiple child windows, you'll want to base it on a descendant of TWin-

dow rather than of TDialog. Again, however, your job will be easier if you create a generic empty program for this purpose. EMPTYWIN.PAS, shown in Figure 7, is this program. You'll note that it bears a very strong resemblance to EMPTYDLG. It incorporates all the same methods, and for the most part, their implementations are the same. The one minor exception is that Init Constructor loads a menu from the resource—a menu whose name (not surprisingly) is the same as that of the program.

The one method that didn't appear in EmptyDlg is Paint. A dialog box automatically knows how to paint itself on-screen, but a window is a much more *general* object. Painting it could involve writing text to the screen, displaying a bitmap, showing the current graph of a

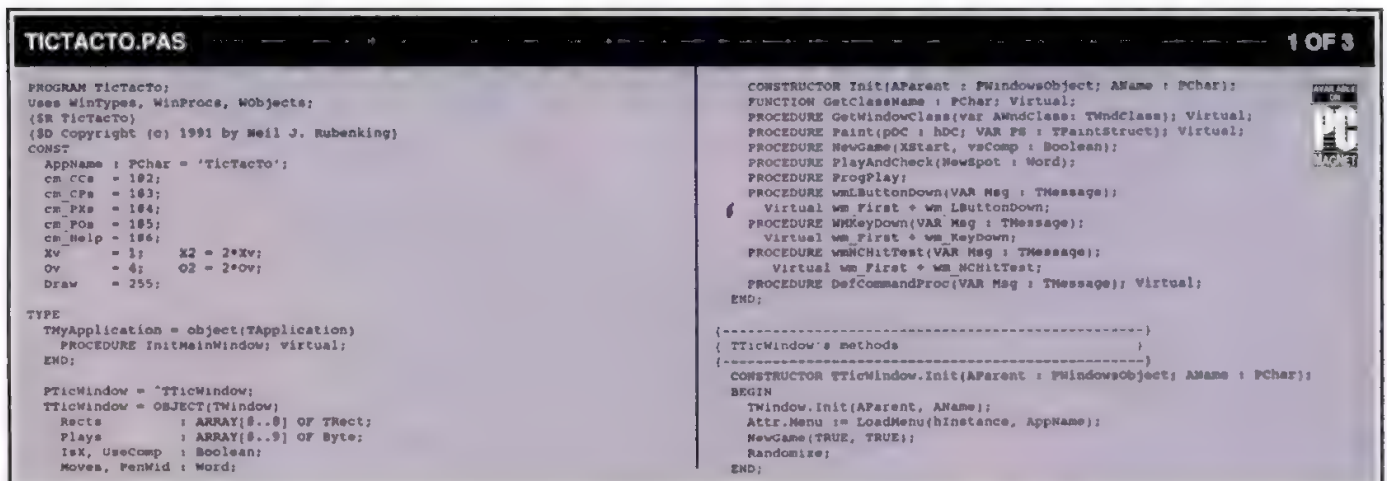


Figure 9: In addition to demonstrating a number of techniques essential to programming with the Object Windows Library, you'll find that this program plays a mean game of tic-tac-toe.


```

SetRect(TR, X16, 2*Y3-Y16, X-X16, 2*Y3-Y16);
IF IntersectRect(TR, TR, FR.rcPaint) <> 0 THEN
    MoveTo(pDC, X16, 2*Y3);
    LineTo(pDC, X-X16, 2*Y3);
END;
SelectObject(pDC, OldP);
DeleteObject(hP);
END;
END;

PROCEDURE TTicWindow.NewGame(XStart, vsComp : Boolean);
BEGIN
    IsX := XStart; UseComp := vsComp;
    FillChar(Plays, sizeof(Plays), 0);
    Plays[9] := 127; Moves := 0;
    InvalidateRect(hWindow, nil, TRUE);
    IF UseComp AND (NOT IsX) THEN ProgPlay;
END;

PROCEDURE TTicWindow.PlayAndCheck(NewSpot : Word);
VAR TR : TRect;

FUNCTION Won : Byte;
VAR M : Word;
BEGIN
    FOR M := 0 TO 2 DO
        CASE Plays[M*3+0] + Plays[M*3+1] + Plays[M*3+2] OF
            3*Xv: BEGIN Won := Xv; Exit; END;
            3*Ov: BEGIN Won := Ov; Exit; END;
        END;
    FOR M := 0 TO 2 DO
        CASE Plays[M*3] + Plays[M*3+1] + Plays[M*3+2] OF
            3*Xv: BEGIN Won := Xv; Exit; END;
            3*Ov: BEGIN Won := Ov; Exit; END;
        END;
    CASE Plays[0] + Plays[4] + Plays[8] OF
            3*Xv: BEGIN Won := Xv; Exit; END;
            3*Ov: BEGIN Won := Ov; Exit; END;
        END;
    CASE Plays[2] + Plays[4] + Plays[6] OF
            3*Xv: BEGIN Won := Xv; Exit; END;
            3*Ov: BEGIN Won := Ov; Exit; END;
        END;
    IF Moves = 9 THEN
        BEGIN Won := Draw; Exit; END;
    Won := 0;
END;

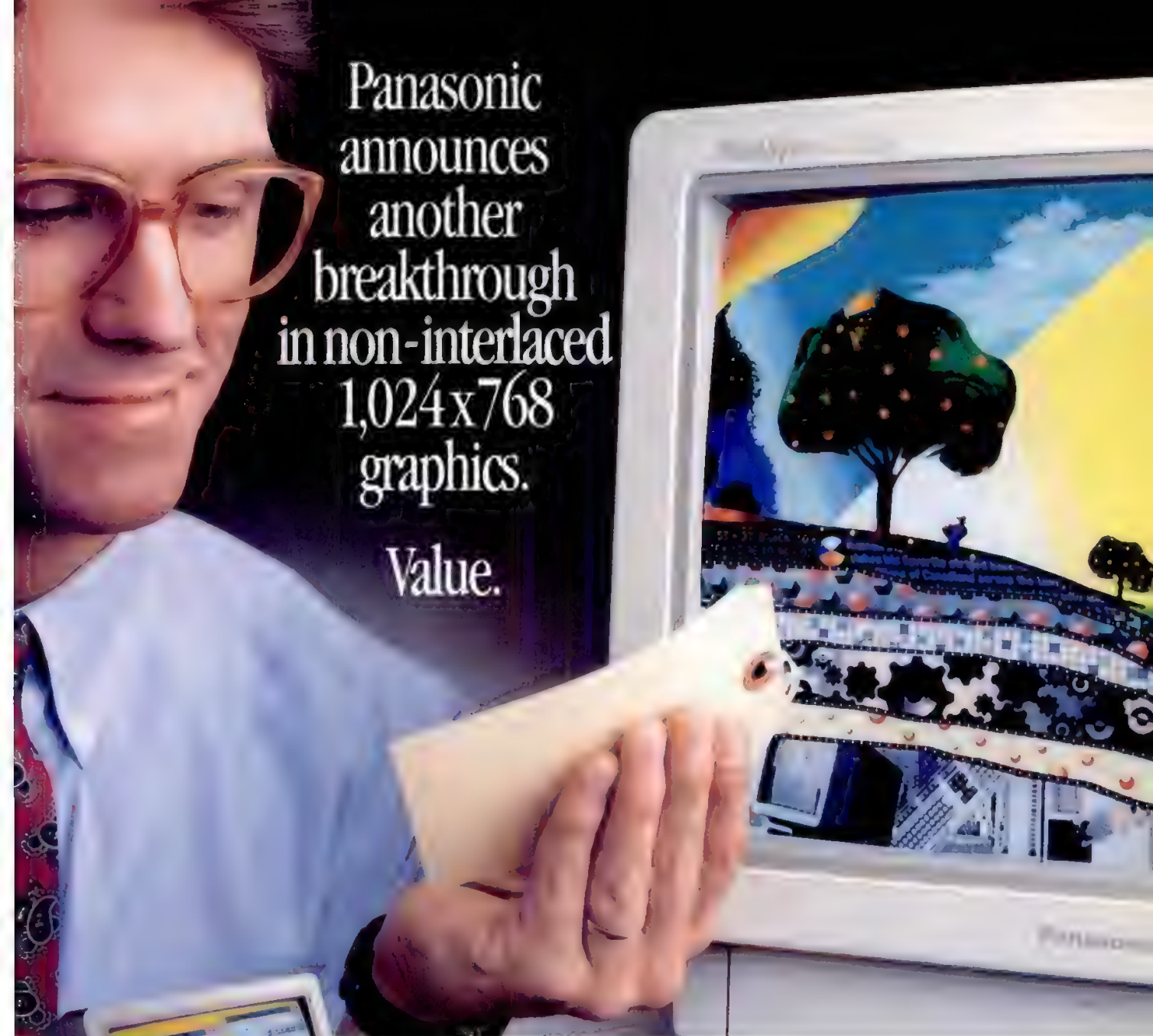
TYPE
    IF Plays[NewSpot] <> 0 THEN
        BEGIN MessageBeep(0); Exit; END;
    IF IsX THEN Plays[NewSpot] := Xv ELSE Plays[NewSpot] := Ov;
    Inc(Moves);
    IsX := NOT IsX;
    TR := RectE(NewSpot);
    InflateRect(TR, PenMid, PenMid);
    InvalidateRect(hWindow, @TR, FALSE);
    CASE Won OF
        Xv : BEGIN
            MessageBox(hWindow, 'X wins!', 'A WINNER!', mb_ok);
            NewGame(IsX XOR Odd(Moves), UseComp);
        END;
        Ov : BEGIN
            MessageBox(hWindow, 'O wins!', 'A WINNER!', mb_ok);
            NewGame(IsX XOR Odd(Moves), UseComp);
        END;
        Draw : BEGIN
            MessageBox(hWindow, 'A Draw!', 'NO WINNER!', mb_ok);
            NewGame(NOT IsX, UseComp);
        END;
    ELSE IF UseComp AND (NOT IsX) THEN ProgPlay;
END;
END;

PROCEDURE TTicWindow.ProgPlay;
VAR spot : Word;
    TR : TRect;
CONST Corners : ARRAY[0..3] OF Byte = (0, 2, 6, 8);

FUNCTION RateThem : Word;
    (NEVER called 't11 after middle square (04) is used)
VAR M, Best, BestRate, a1, a2, d1, d2,
    g1, g2, ac, dc, dg : Word;
    Ratings : ARRAY[0..8] OF Byte;
PROCEDURE UpdateBest(Mum, Value : Word);
BEGIN
    Ratings[Mum] := Value;
    IF Value > BestRate THEN
        BEGIN BestRate := Value; Best := Mum; END;
    END;
END;

BEGIN
    Best := 0; BestRate := 0;
    FOR M := 0 TO 8 DO
        BEGIN
            IF Plays[M] <> 0 THEN Ratings[M] := 0
            ELSE
                BEGIN
                    a1 := (M DIV 3) + 3; a2 := succ(a1);
                    IF a1 = M THEN Inc(a1, 2);
                    IF a2 = M THEN Inc(a2);
                    d1 := M MOD 3; d2 := d1 DIV 3;
                    IF d1 = M THEN Inc(d1, 6);
                    IF d2 = M THEN Inc(d2, 3);

```



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TICTACTO.PAS

3 OF 3

```

g1 := 4;
IF Odd(N) THEN
  BEGIN g1 := 9; g2 := 9; END
ELSE
  CASE N OF
    8 : g2 := 8;
    2 : g2 := 6;
    6 : g2 := 2;
    4 : g2 := 4;
  END;
ac := Plays[a1] + Plays[a2];
dn := Plays[d1] + Plays[d2];
dg := Plays[g1] + Plays[g2];
IF (ac=02) OR (dn=02) OR (dg=02) THEN
  UpdateBest(N, 5)
ELSE IF (ac=X2) OR (dn=X2) OR (dg=X2) THEN
  UpdateBest(N, 4)
ELSE IF (ac+dn=02) OR (ac+dg=02) OR (dn+dg=02) THEN
  UpdateBest(N, 3)
ELSE IF (ac=0v) OR (dn=0v) OR (dg=0v) THEN
  UpdateBest(N, 2)
ELSE UpdateBest(N, 1);
END;
RateThem := Best;
END;

BEGIN
  CASE Moves OF
    0 : Spot := 4;
    1 : BEGIN
        IF Plays[4] = 9 THEN Spot := 4
        ELSE Spot := Corners[Random(4)];
      END;
    ELSE Spot := RateThem;
  END;
  PlayAndCheck(Spot);
END;

PROCEDURE TTicWindow.WmLButtonDown(VAR Msg : TMessage);
VAR M : Word;
BEGIN
  M := 0;
  {determine if the mouse is in any of our rectangles}
  WHILE (M < 9) AND (NOT PtInRect(Rects[M], TPoint(Msg.LParam))) DO
    Inc(M);
  IF M < 9 THEN PlayAndCheck(M);
END;

PROCEDURE TTicWindow.WmKeyDown(VAR Msg : TMessage);
VAR T : TPoint;
    N : Integer;
BEGIN
  GetCursorPos(T);
  ScreenToClient(hWindow, T);
  M := 0;
  {determine if the mouse is in any of our rectangles}
  WHILE (M < 9) AND (NOT PtInRect(Rects[M], T)) DO Inc(M);
  IF M = 9 THEN M := 0
  ELSE
    CASE Msg.WParam OF
      vk_Tab : M := Succ(M) MOD 9;
      vk_Right : IF (M MOD 3) = 2 THEN Dec(M,2) ELSE Inc(M);
      vk_Left : IF (M MOD 3) = 0 THEN Inc(M,2) ELSE Dec(M);
      vk_Down : IF (M DIV 3) = 2 THEN Dec(M, 6) ELSE Inc(M, 3);
      vk_Up : IF (M DIV 3) = 0 THEN Inc(M, 6) ELSE Dec(M, 3);
    END;
  END;
  PlayAndCheck(M);
END;

vk_Space,
vk_Return: PlayAndCheck(M);
END;
WITH Rects[M] DO
  BEGIN
    T.X := (Right + Left) DIV 2;
    T.Y := (Bottom + Top) DIV 2;
  END;
  ClientToScreen(hWindow, T);
  SetCursorPos(T.X, T.Y);
  DefWndProc(Msg);
END;

PROCEDURE TTicWindow.WmNCHitTest(VAR Msg : TMessage);
VAR M : Word;
    Pt : TPoint;
    CurA : hCursor;
BEGIN
  Move(Msg.LParam, Pt, 4);
  ScreenToClient(hWindow, Pt);
  M := 0;
  WHILE (M < 9) AND (NOT PtInRect(Rects[M], Pt)) DO
    Inc(M);
  IF M < 9 THEN
    BEGIN
      IF Plays[M] <> 9 THEN CurA := LoadCursor(hInstance, 'CurM');
      ELSE IF IsX THEN CurA := LoadCursor(hInstance, 'CurX');
      ELSE CurA := LoadCursor(hInstance, 'CurO');
    END;
    CurA := LoadCursor(0, idc_arrow);
    SetCursor(CurA);
    DefWndProc(Msg);
  END;
END;

PROCEDURE TTicWindow.DefCommandProc(VAR Msg : TMessage);
VAR PD : PDialog;
BEGIN
  IF Msg.WParamHi = 0 THEN
    CASE Msg.WParamLo OF
      cm_CCS : NewGame(FALSE, TRUE);
      cm_CPS : NewGame(TRUE, TRUE);
      cm_FXS : NewGame(TRUE, FALSE);
      cm_FOS : NewGame(FALSE, FALSE);
      cm_Help : BEGIN
        New(PD, Init(@Self, 'TicHelp'));
        Application.ExecDialog(PD);
      END;
    ELSE TTicWindow.DefCommandProc(Msg);
  END;
END;

{-----}
{ TMyApplication's method implementations: }
{-----}
PROCEDURE TMyApplication.InitMainWindow;
BEGIN MainWindow := New(TTicWindow, Init(nil, AppName)); END;

{-----}
{ Main program: }
{-----}
VAR MyApp: TMyApplication;
BEGIN
  MyApp.Init(AppName);
  MyApp.Run;
  MyApp.Done;
END.

```

function—almost anything. As the STEP??P.AS example programs in the *Windows Programming Guide* show, a Paint method must be able to redraw the whole window from scratch. Drawing on the screen isn't enough; your window has to *remember* what has already been drawn on-screen and re-create it on demand.

The resource file for the generic empty window program includes a menu and an icon, both named EmptyWin. The OWL units define a number of `cm_xxxx` constants to be returned by certain Edit, File, and window menu items. If a program uses any of these standard menu items, it should associate them with the corresponding `cm_xxxx` constant, for many of the OWL objects respond to them automatically. For example, if the File/Exit menu item has the value `cm_Exit` (5F14h), click-

ing that item will exit the program. Including the file WOBJECTS.H (which resides in the OWL directory) in the script version of the menu (shown in Figure 8) makes these constants accessible by name. All the standard menu items appear in the EmptyWin menu, so when building a program based on it you can simply delete those that aren't needed.

EMPTYWIN.PAS is a complete working Windows application. You can move, resize, maximize, or iconize it. The menu is functional, but only the File/Exit option has any effect. Use this file as a template any time you want to create a window-based OWL program.

TIC-TAC-TOE IN WINDOWS

TICTACTO.PAS, listed in Figure 9, is based on EMPTYWIN in the same way

that SELECTO is based on EMPTYDLG, but it incorporates several new methods. TICTACTO is a more complete program than SELECTO: It *plays* tic-tac-toe, and never loses!

The first thing to look at is the resource, TICTACTO.RES. TICTACTO.RES not only changes the EmptyWin menu substantially, but it adds a help dialog box and three custom cursors shaped like an X, an O, and a slashed-circle NO symbol. Figure 10 shows the O cursor loaded into the resource editor (with a game of tic-tac-toe on-screen). The cursor's *hot spot*—the precise point that Windows uses when reporting the cursor location—is right in the middle.

All that is retained from the EmptyWin menu is the File/Exit command. Fortunately, it's very easy to delete the

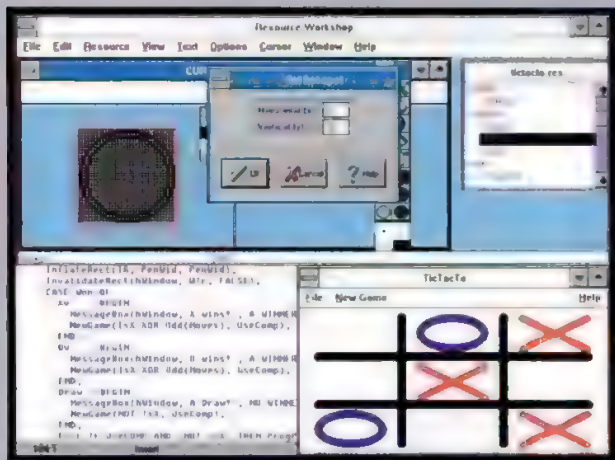


Figure 10: TICTACTO.PAS changes the Windows cursor to match the context. The hot spot in the O cursor shown here is right in its center.

unwanted options. The five new menu items include Help and options to restart the game with a computer or human opponent and with X or O playing first. Note that the Help menu item does *not* call the Windows help system; it simply displays a dialog box.

Like SELECTO.PAS, TICTACTO.PAS starts with a number of new constants. Five of them correspond to the ID numbers of the added menu items. The others are used internally by the program: Xv is the X-value, Ov the O-value, and Draw signals a drawn game.

The TTicWindow object has six data fields. Rects is an array of nine rectangles that define the nine squares in the tic-tac-toe diagram. Plays stores the value of each square—empty, Xv, or Ov. IsX is TRUE when it's X's turn to play, FALSE otherwise. UseComp is TRUE only if the program is playing. Moves counts the number of moves so far, and PenWid holds the width of the pen.

TTicWindow's constructor attaches the menu from the resource file to the main window, calls NewGame to initialize the data fields, and seeds the random-number generator. SetUpWindow and Done have been eliminated as unnecessary, and GetClassName is unchanged from the template program. The GetWindowClass method has one simple but very important added line. The program is going to change the shape of the cursor, and to make that possible the hCursor field for its window class must be set to 0.

THE INDISPENSABLE PAINT METHOD

The Paint method has to be able to redraw all or part of a program's main window on demand. It receives a *device context* to use in its calls to drawing routines. It also receives a PS parameter of type TPaintStruct that contains a variety of information about what is to be painted. Specifically, the rcPaint field of PS defines the rectangular area that must be repainted. If this is equal to the entire working area of the window (as returned by the API function GetClient-Rect), Paint draws the tic-tac-toe diagram, updates the Rects array, and fills in all the squares. If PS.rcPaint does not describe the window's full area, Paint fills in only the affected square.

This is an important point. A Paint method should redraw only as much of the window as is necessary. In this example program it doesn't make much difference, but what if the Xs and Os were 256-color bitmaps that had to be stretched to fit? To demonstrate the benefits of redrawing only what you must, try deleting the `x` in the line `{x$DEFINE ShowSlow}`, just before the Paint method's implementation. This enables a slow-down loop in the routine that paints each square of the diagram. Play five or six moves, then maximize the window. You'll see that each square gets drawn on-screen with a visible delay. Now make another play—only the square you played had to be redrawn.

For clarity, the Paint method establishes local variables equal to the *x* and *y* dimensions of the window and to $1/3$ and

$1/6$ of those dimensions. It also defines a pen width proportional to the window size. If the whole window needs repainting, Paint creates a solid black pen of the calculated width, selects it into the current device context, draws the tic-tac-toe diagram, and deletes the pen.

Note this series of events carefully, for it's very common in Windows programming. You create a drawing implement, select it (at the same time saving the previously selected implement), use it, restore the previous implement, and delete the one you created. If you fail to delete what you created, your program will gradually eat away at the limited drawing resources.

The next section of Paint sets the current dimensions of the nine TRects in the Rects array. It first sets each TRect to the exact dimensions of a particular $1/9$ of the screen, then shrinks it (using the API routine InflateRect) to a size that fits comfortably *inside* the space.

Paint then calls the OneSquare procedure for each one of the nine TRects. To make an X, it creates a red pen and then draws diagonal lines connecting the corners of the TRect. To make an O, it creates a blue pen and then draws an ellipse that fills the TRect. In either case, Paint restores the previous pen and deletes the new pen on completion.

Having seen what Paint does to redraw the whole window, consider next what happens when only a portion of the window is to be drawn. In this case, Paint checks each of the nine TRects to see whether it has any intersection with PS.rcPaint. The IntersectRect API procedure creates a new rectangle equal to the intersection of its two input rectangles; it creates an empty rectangle if they don't intersect. If the intersection is nonempty, Paint calls OneSquare for that particular TRect.

The next two methods take care of program housekeeping. Procedure NewGame empties the Plays array, zeros out the Moves counter, notes whether the program should play and which player goes first, and repaints the window. There's no call to Paint here; the Windows API call InvalidateRect is commonly used to force a window to repaint. (If you specify a rectangular area in the second parameter, it just repaints that area. If, as here, you use NIL for that parameter, it repaints the whole window.) Finally, if it's the program's turn to play, NewGame calls ProgPlay.

An X or O can get placed in any of several ways: via ProgPlay, by the user's mouse click, or from the keyboard. The process of making a play is handled by the PlayAndCheck method. After ensuring that the square is available, PlayAndCheck updates the internal variables and paints the newly placed X or O. Again, it calls InvalidateRect to get the area painted, and this time the TRect in which the character fits is inflated to account for the pen's width.

Next it checks to see if anyone has won the game. The WON function returns one of four values. If either player has three in a row, it returns the constant corresponding to that player. If neither has won and all nine squares are filled, it returns a value indicating a draw. In any other case, it returns zero. WON checks for winners by brute force; it simply goes through every possible three in a row and sums the values stored in those cells. If the sum is three times Xv, then X has won. If it's three times Ov, then O has won. Note that the constants Xv and Ov are set to 1 and 4 in the program—Ov *must* be greater than three times Xv! Finally, if it's the program's turn, PlayAndCheck calls ProgPlay. Unfortunately, there's not enough space here to explain just *how* ProgPlay selects the program's move—but it never loses!

MESSAGE RESPONSE METHODS

A TTicWindow has special response methods for three particular Windows messages: `WM_LButtonDown` (the user pressed the left mouse button), `WM_KeyDown` (the user pressed a key), and `WM_NcHitTest` (the mouse moved while within this program's window). The first two response methods handle user input; the third is responsible for changing the cursor's shape depending on its location.

The first thing the `WMLButtonDown` method has to do is determine *where* the mouse was clicked. That's easy, for the `Msg` parameter carries the coordinates of the mouse click in its `lParam` field. The method checks this point against each of the nine TRects to see if the mouse click occurred within it. If the mouse is in one of them, it calls `PlayAndCheck`.

The `WMKeyDown` method must also determine in which TRect the cursor is located, but the `WM_KeyDown` message doesn't carry the coordinates. The API function `GetCursorPos` grabs the cursor position, and the function `ScreenToClient` converts that position to this window's

coordinate system. As before, variable `N` gets the number of the TRect in which the cursor resides. If it's not in any of them, the routine sets `N` to 0, which places the cursor in the first square. Otherwise, the method checks which key was pressed. For Tab or arrow keys, it sets an appropriate new value of `N`. For Spacebar or Enter, it attempts to play in the current TRect. Finally, it positions the cursor in the middle of the selected TRect.

Like `WMLButtonDown`, `WMNcHitTest` receives the current location of the mouse in `Msg.LParam`, but in this case

TICTACTO.PAS
illustrates the process
of moving from a
generic window-based
program to one that
serves a particular
purpose.

the location is based on full-screen coordinates. The API function `ScreenToClient` adjusts the point to the window's coordinates. The method then checks whether the cursor is within one of the control TRects. If it is, and if the square is occupied, it sets the cursor to `CurNO`. If the square is unoccupied, it sets the cursor to `CurX` or `CurO`, depending on whose turn it is. In any other case, it restores the default arrow cursor. When you run the program, try moving the cursor around; depending on its location, it will be an arrow, a big X, a big O, or a slashed-circle "NO" symbol.

I could have written separate message response methods for each of the menu-generated command messages, but instead I overrode `DefCommandProc` to catch *all* such messages. Four of them call `NewGame`, and the fifth displays the dialog box `TicHelp`. To do so, it initializes a `PDialog` variable from the program's resource and displays it by calling the main application's `ExecDialog` method. Because the Ok button in the dialog box

returns `Id_Ok` (1), no further processing is necessary.

Although you can play tic-tac-toe with this program, its real purpose is didactic. `TICTACTO.PAS` illustrates the process of moving from a generic window-based program to one that serves a particular purpose. Its methods can serve as models for other programs; almost any window-based program will have a `Paint` method and methods to respond to the mouse and keyboard. The program also demonstrates just how to change the cursor shape to vary with its position. After studying `TICTACTO.PAS` enough to get a feel for how it works, you'll find it easier to write your own OWL programs.

THE API PROBLEM

As is apparent from the example programs above, all but the simplest OWL programs will have to make some Windows API calls, especially if they use graphics. Every time you draw a line, fill a rectangle, or even put text on a window, you need to call the Windows API. `TPWin` gives you access to every one of the over-500 API calls, but its only reference is an alphabetic list. When you're trying to do something you've never done before in Windows, it's not easy to figure out which API call you need.

You can, of course, seek example programs that demonstrate the technique you're trying to apply. C programs are fine for this purpose—the Windows messages and API calls have the same names. My own solution, however, was to purchase the *Microsoft Windows Programmer's Reference*. This weighty tome lists all of the API functions, Windows messages, Windows constants, and so on, in a detailed and cross-referenced format. For example, if you have a problem with screen coordinates, check the chapter on "Graphics Device Interface Functions," subheading "Coordinate Functions." The book is well worth its \$40 price.

Fortunately, mastering all—or even most—of the API functions isn't a prerequisite for programming with OWL. You can simply dive into Windows programming and learn the API in bits and pieces, as the need arises. I vowed not to program in Windows until I could use Turbo Pascal, my language of choice. I'm glad I waited—but I'm even happier that my waiting is over! ■

Neil J. Rubenking is technical editor of PC Magazine.



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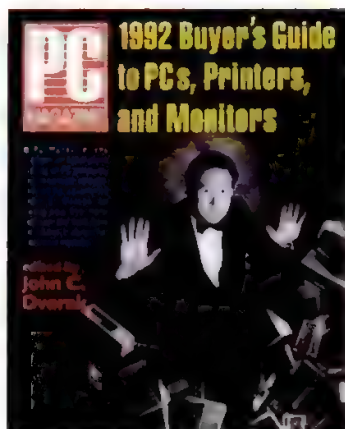
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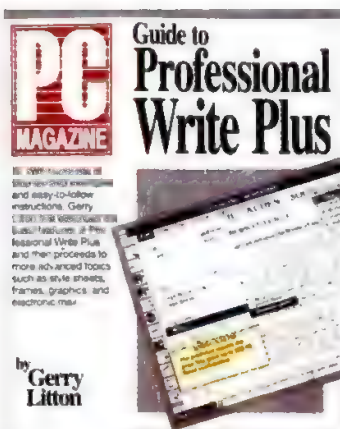
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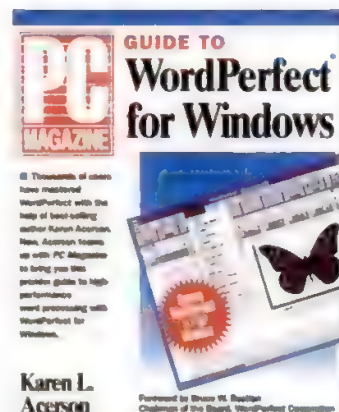
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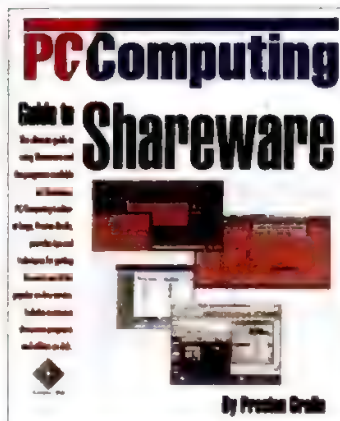
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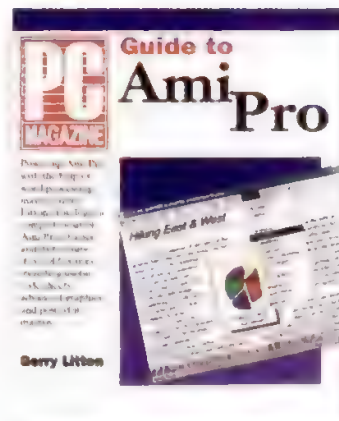
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by
Charles Petzold

Environments

When you hear Windows programmers talking about MCI these days, don't assume they're referring to the long-distance telephone service or the electronic mail system. It could very well be that they're discussing the Media Control Interface component of the Multimedia Extensions to Windows.

MCI is a high-level interface to virtually all types of multimedia hardware, including waveform audio, MIDI synthesizers, CD audio, videodisk players, audio tape recorders, VCRs, scanners, and video graphics. (Of course, MCI drivers for many of these devices don't yet exist, but that's probably just a matter of time.) In many cases, the MCI commands to control these devices are the same or very similar. This is possible because all these multimedia devices are capable of play and/or record operations.

Think about it: Playing music CDs or videodisks under computer control should be very much the same. You should be able to tell the hardware the position on the CD or videodisk where playing is to begin and end, and in addition you should be able to pause the device whenever you want. Audio tape recorders and VCRs are quite similar too in the way they can be controlled for both recording and playing back tapes.

Using a tape recorder metaphor for waveform audio or MIDI synthesizer hardware also makes sense. The difference between this type of hardware and a real tape recorder is that the sound or music data can be stored in the computer in memory or files. Similarly, a scanner is a record-only device that obtains bitmap data from a photograph or other graphical image.

MCI is implemented in two different but related forms. The first form uses messages and data structures to send commands to multimedia devices and to receive information from them. The second form uses ASCII text strings. The text-based interface was originally created to allow multimedia devices to be

An Introduction To the Media Control Interface

■ MCI is a high-level interface to virtually all types of multimedia hardware. But there's a trade-off: It's generally easier than using the low-level waveform audio API, but you don't have quite the same flexibility.

controlled from simple scripting languages. But it also provides very easy interactive control: All you need is a program to execute the MCI command strings you type in. Indeed, the Multimedia Developers Kit (MDK) includes a program named MCITEST that does precisely this.

There are only six MCI function calls, each beginning with the prefix mci. I'll be discussing two of them in this column and two more in the next. But don't let this low number fool you: Learning how to use MCI requires you to become familiar with a whole new bunch of messages, constants, data structures, and text commands.

In the last issue, I showed you a program called RECORD1 that used the low-level waveform audio API (functions beginning with the prefix wave) to implement a digital sound recorder. In this column, we'll take a look at the new version—RECORD2—that uses the MCI message interface. And in the next issue, RECORD3 will demonstrate text-based MCI. As we'll see, there's a trade-off

when you use MCI. It's generally easier than using the low-level waveform audio API, but you don't have quite the same flexibility.

You'll recall that RECORD1 saved recorded raw sound data in a large memory buffer, and played it back from this buffer. This allowed me to include some "special effects" in RECORD1. The program could reverse the order of the bytes to play the sound backward, or double the sampling rate to play it twice as fast. However, MCI uses files rather than memory blocks to store waveform audio data. Implementing such special effects would require accessing and modifying the waveform file. For this reason, I haven't included these options in RECORD2 and RECORD3.

THE RECORD2 PROGRAM

All source code for the RECORD2 program is shown in Figures 1 through 6. If you're using Microsoft C 6.0 Compiler and the Windows Software Development Kit (SDK), you can create RECORD2.EXE by executing

```
MAKE RECORD2.MSC
```

If you're using the Borland C++ 2.0 Compiler, execute the command

```
MAKE -fRECORD2.BCF
```

In either case, you must also have the Multimedia Developers Kit (MDK) installed. If you're using the Borland compiler, the MDK should be installed in the same directories as the compiler.

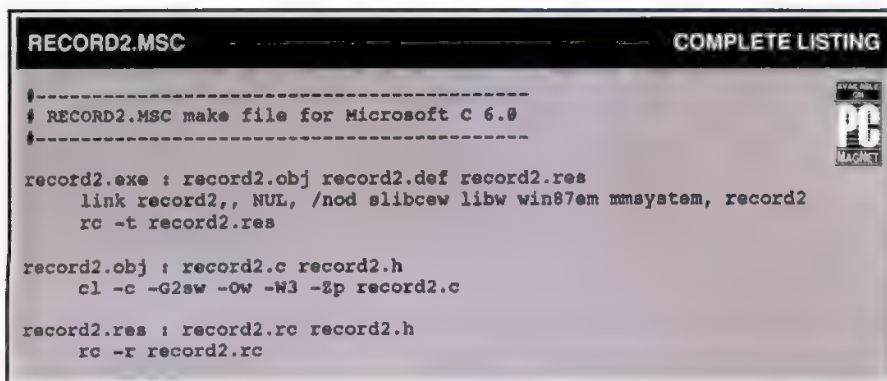


Figure 1: This is a Make file for the Microsoft C 6.0 Compiler and the Windows Software Development Kit (SDK).

RECORD2's main window is a dialog box containing five buttons: Record and End for recording sound and Play, Pause, and End for playing back sound. Pressing any one of these buttons causes a WM_COMMAND message to be sent to the window procedure, which then responds by making the appropriate MCI function call.

TWO MCI FUNCTIONS

RECORD2 uses only two MCI function calls; this one is the most important:

```

dwError = mciSendCommand (wID,
    dwMsg, dwParam1, dwParam2)
    
```

The first parameter is a numeric identification number for the device. It's used much like a handle. You obtain the ID when you open the device and then you can use it in subsequent mciSendCommand calls.

The second parameter is a constant beginning with the prefix MCI. These are called MCI command messages, and RECORD2 demonstrates seven of them: MCI_OPEN, MCI_RECORD, MCI_STOP, MCI_SAVE, MCI_PLAY, MCI_PAUSE, and MCI_CLOSE.

The dwParam1 parameter is generally composed of zero or more bit flag constants combined with the C bitwise OR operator, which usually indicates various options. Some options are specific to particular command messages and some are common to all messages. The dwParam2 parameter is typically a long pointer to a data structure; it is also for indicating options and obtaining information from the device. Many of the MCI messages are associated with data structures that

are unique to the message.

The mciSendCommand function returns zero if the function is successful and returns an error code otherwise. To report this error to the user, you can obtain a text string that describes the error:

```

mciGetErrorString (dwError,
    szBuffer, wLength)
    
```

The first parameter is the error code returned from the mciSendCommand function, the second parameter points to a buffer that is filled with the error message, and the third parameter is the length of the buffer.

Using just these two function calls, RECORD2 is able to implement much of the basic functionality of a digital sound recorder.

OPENING THE HARDWARE

When the user presses either the Record or Play button, RECORD2's window procedure receives a WM_COMMAND message with wParam equal to ID_

RECORD_BEG or ID_PLAY_BEG. In either case, RECORD2 begins by opening the device. This involves setting the fields of an MCI_OPEN_PARMS structure and calling mciSendCommand with the MCI_OPEN command message.

As you can see in RECORD2.C (Figure 3), I've set all the fields of the MCI_OPEN_PARMS structure to zero or NULL except for the lpstrElementName field. This field is set to the filename RECORD2.WAV, which is used for storing the sound data. The MCI_OPEN_ELEMENT flag included in the third parameter to mciSendCommand indicates that the lpstrElementName field is a valid filename. MCI knows from the filename extension .WAV that you wish to open a waveform audio device. If multiple waveform hardware is present, it opens the first device. (It's also possible to use something other than the first waveform device by setting the lpstrDeviceType field of the MCI_OPEN_PARMS structure.)

For recording, the MCI driver uses a default sampling rate and sample size, but you can change that if you prefer using the MCI_SET command. During recording, the sound data is stored on the hard disk in a temporary file. Later on (as I'll discuss), this data can be transferred to the file indicated in the lpstrElementName field. I'll discuss the format of waveform files in the next installment of this column. For playing back the sound, MCI uses the sampling rate and sample size defined in the waveform file.

If RECORD2 can't open a device, it uses mciGetErrorString and MessageBox to tell the user what the problem is. Otherwise, on return from the mciSendCommand call, the wDeviceID field contains the device ID used in subsequent calls.

To begin recording, RECORD2 calls mciSendCommand with the MCI_RE-

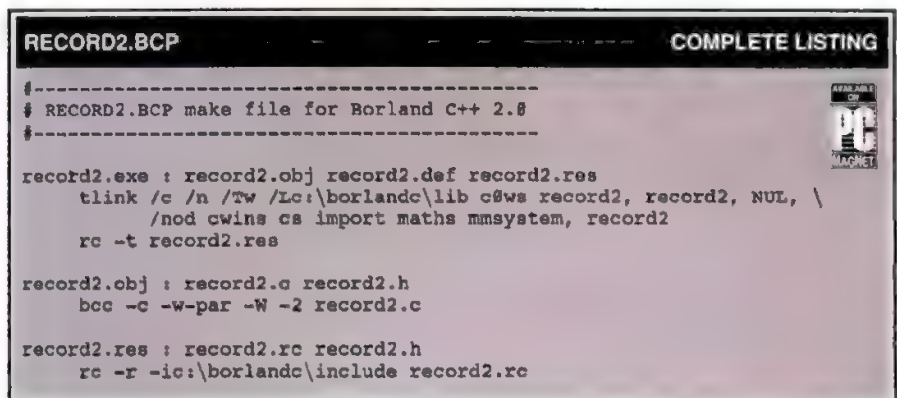
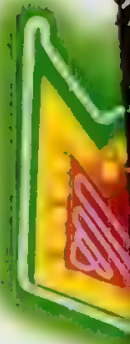
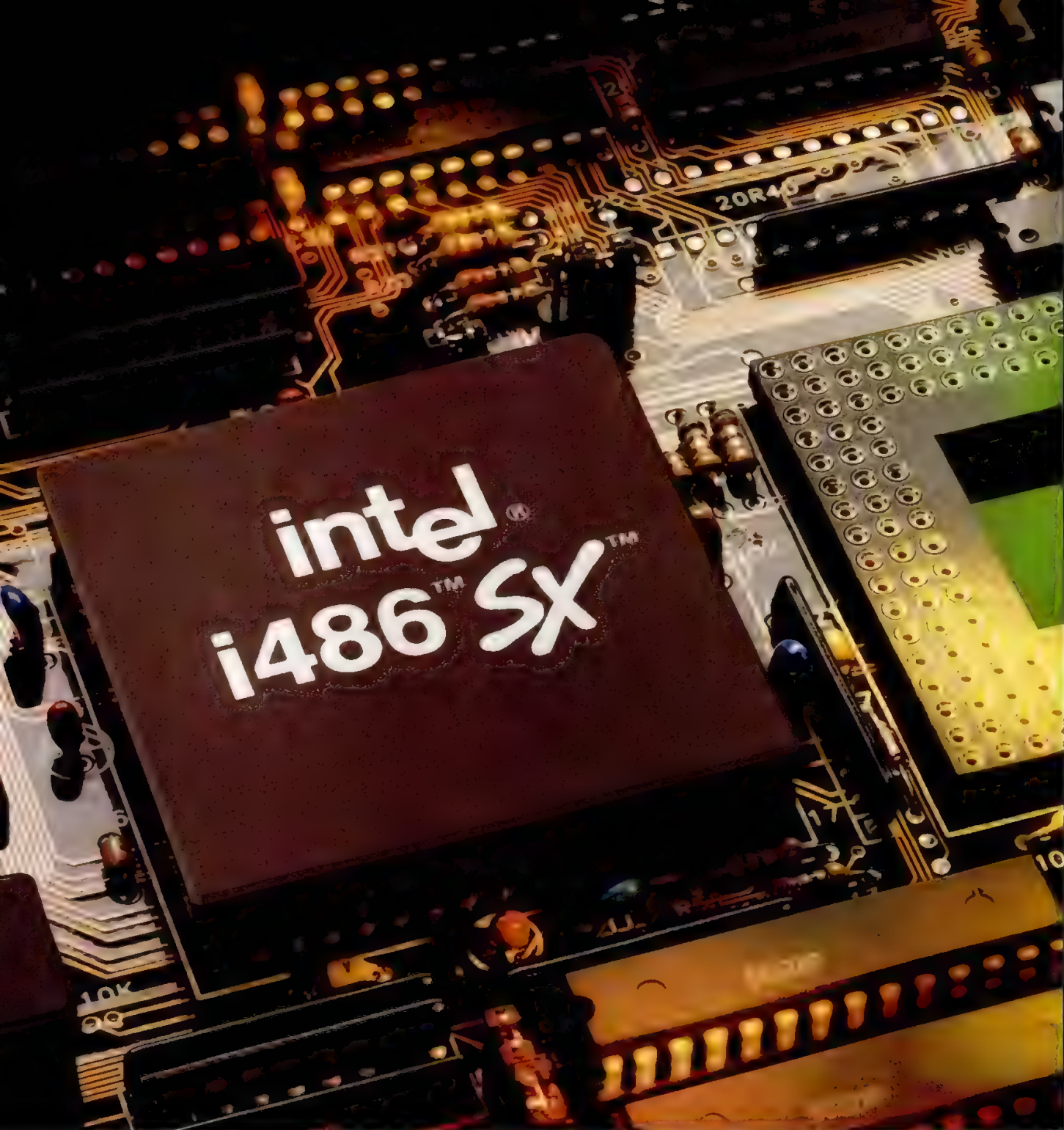


Figure 2: Here is the Make file for the Borland C++ 2.0 Compiler.

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CORD command message and the MCI_WAVE_RECORD_PARMS data structure. Optionally, you can set the dwFrom and dwTo fields of this structure (and use bit flags that indicate these fields are set) to insert a sound into an existing waveform file. By default, any new sound is inserted at the beginning of an existing file. This is why RECORD2 deletes any existing file before opening waveform audio for recording.

RECORD2 sets the dwCallback field of the MCI_WAVE_RECORD_PARMS to the program's window handle and includes the MCI_NOTIFY flag in the mciSendCommand call. This causes a notification message to be sent to the window procedure when recording has been completed. I'll discuss this notification message later.

Playing a waveform audio file is very similar to recording, and involves an mciSendCommand call with the MCI_PLAY command message and an MCI_PLAY_PARMS structure. Any part of the file may be played, but RECORD2 chooses to play it all.

You'll normally want to record a sound or play a sound file in the background.

The documentation of the MM_MCINOTIFY message in the beta version of the MDK is not very good; it's not at all clear under what circumstances you'll receive this message.

This is the default. You can also use the MCI_WAIT flag to prevent mciSendCom-

mand from returning until after the operation is complete.

After the mciSendCommand calls to begin recording or playing, RECORD2 enables and disables the appropriate pushbuttons. At least in the beta version of Multimedia Windows, there's a couple of seconds delay in the mciSendCommand calls, which you'll notice by the delay in the buttons changing state. Consequently, after you press the Record button, don't actually begin recording until the Record button is disabled and the End button is enabled.

PAUSING AND ENDING

RECORD2 also includes a Pause button for pausing the playback of a sound file. This button generates a WM_COMMAND message with wParam equal to ID_PLAY_PAUSE. The program responds by calling mciSendCommand with the MCI_PAUSE command message and an MCI_GENERIC_PARMS structure. This structure is used for any message that requires no information except an optional window handle for notification. If

RECORD2.C

1 OF 2

```

/*-----
RECORD2.C -- Multimedia Windows Waveform Audio Recorder
(c) Charles Petzold, 1991
-----*/

#include <windows.h>
#include <mmsystem.h>
#include <stdio.h>
#include "record2.h"

BOOL FAR PASCAL DlgProc (HWND, WORD, WORD, LONG);

static char szAppName [] = "Record2";

int PASCAL WinMain (HANDLE hInstance, HANDLE hPrevInstance,
LPSTR lpszCmdLine, int nCmdShow)
{
    FARPROC lpDlgProc;

    lpDlgProc = MakeProcInstance (DlgProc, hInstance);
    DialogBox (hInstance, szAppName, NULL, lpDlgProc);
    FreeProcInstance (lpDlgProc);

    return 0;
}

void ShowError (HWND hwnd, DWORD dwError)
{
    static char szErrorStr [80];

    mciGetErrorString (dwError, szErrorStr, 80);
    MessageBeep (MB_ICONEXCLAMATION);
    MessageBox (hwnd, szErrorStr, szAppName, MB_OK | MB_ICONEXCLAMATION);
}

BOOL FAR PASCAL DlgProc (HWND hwnd, WORD message, WORD wParam, LONG lParam)
{
    static BOOL      bRecording, bPlaying, bPaused;
    static char      szFileName[] = "record2.wav";
    static WORD      wDeviceID;
    static WORD      dwError;
    MCI_GENERIC_PARMS mciGeneric;
    MCI_OPEN_PARMS mciOpen;
    MCI_PLAY_PARMS mciPlay;
    MCI_WAVE_RECORD_PARMS mciRecord;

    switch (message)
    {
        case WM_COMMAND:
            switch (wParam)
            {
                case ID_RECORD_BEG:
                    // Delete Existing Waveform File
                    remove (szFileName);

                    // Open Waveform Audio
                    mciOpen.dwCallback = 0;
                    mciOpen.wDeviceID = 0;
                    mciOpen.wReserved = 0;
                    mciOpen.lpstrDeviceType = NULL;
                    mciOpen.lpstrElementName = szFileName;
                    mciOpen.lpstrAlias = NULL;

                    dwError = mciSendCommand (0, MCI_OPEN,
                        MCI_WAIT | MCI_OPEN_ELEMENT,
                        (DWORD) (LPWCI_OPEN_PARMS) &mciOpen);

                    if (dwError != 0)
                    {
                        ShowError (hwnd, dwError);
                        return TRUE;
                    }

                    // Save the Device ID
                    wDeviceID = mciOpen.wDeviceID;

                    // Begin Recording
                    mciRecord.dwCallback = hwnd;
                    mciRecord.dwFrom = 0;
                    mciRecord.dwTo = 0;

                    mciSendCommand (wDeviceID, MCI_RECORD, MCI_NOTIFY,
                        (DWORD) (LPWCI_WAVE_RECORD_PARMS) &mciRecord);

                    // Change Enabled Buttons
                    EnableWindow (GetDlgItem (hwnd, ID_RECORD_BEG), FALSE);
                    EnableWindow (GetDlgItem (hwnd, ID_RECORD_END), TRUE);
                    EnableWindow (GetDlgItem (hwnd, ID_PLAY_BEG), FALSE);
                    EnableWindow (GetDlgItem (hwnd, ID_PLAY_PAUSE), FALSE);
                    EnableWindow (GetDlgItem (hwnd, ID_PLAY_END), FALSE);
                    SetFocus (GetDlgItem (hwnd, ID_RECORD_END));

                    bRecording = TRUE;
                    return TRUE;

                case ID_RECORD_END:
                    // Stop Recording
                    mciGeneric.dwCallback = 0;

                    mciSendCommand (wDeviceID, MCI_STOP, MCI_WAIT,
                        (DWORD) (LPWCI_GENERIC_PARMS) &mciGeneric);

                    // Save the File
            }
    }
}

```

Figure 3: This is a listing of all the C source code for the program.

```

mciSendCommand (wDeviceID, MCI_SAVE, MCI_WAIT,
(DWORD) (LPMCI_GENERIC_PARMS) &mciGeneric);

// Close the Waveform Device
mciSendCommand (wDeviceID, MCI_CLOSE, MCI_WAIT,
(DWORD) (LPMCI_GENERIC_PARMS) &mciGeneric);

// Change Enabled Buttons
EnableWindow (GetDlgItem (hwnd, ID_RECORD_BEG), TRUE);
EnableWindow (GetDlgItem (hwnd, ID_RECORD_END), FALSE);
EnableWindow (GetDlgItem (hwnd, ID_PLAY_BEG), TRUE);
EnableWindow (GetDlgItem (hwnd, ID_PLAY_PAUSE), FALSE);
EnableWindow (GetDlgItem (hwnd, ID_PLAY_END), FALSE);
SetFocus (GetDlgItem (hwnd, ID_PLAY_BEG));

bRecording = FALSE;
return TRUE;

case ID_PLAY_BEG:
// Open Waveform Audio
mciOpen.dwCallback = 0;
mciOpen.wDeviceID = 0;
mciOpen.wReserved0 = 0;
mciOpen.lpstrDeviceType = NULL;
mciOpen.lpstrElementName = szFileName;
mciOpen.lpstrAlias = NULL;

dwError = mciSendCommand (0, MCI_OPEN,
MCI_WAIT | MCI_OPEN_ELEMENT,
(DWORD) (LPMCI_OPEN_PARMS) &mciOpen);

if (dwError != 0)
{
ShowError (hwnd, dwError);
return TRUE;
}

// Save the Device ID
wDeviceID = mciOpen.wDeviceID;

// Begin Playing
mciPlay.dwCallback = hwnd;
mciPlay.dwFrom = 0;
mciPlay.dwTo = 0;

mciSendCommand (wDeviceID, MCI_PLAY, MCI_NOTIFY,
(DWORD) (LPMCI_PLAY_PARMS) &mciPlay);

// Change Enabled Buttons
EnableWindow (GetDlgItem (hwnd, ID_RECORD_BEG), TRUE);
EnableWindow (GetDlgItem (hwnd, ID_RECORD_END), FALSE);
EnableWindow (GetDlgItem (hwnd, ID_PLAY_BEG), TRUE);
EnableWindow (GetDlgItem (hwnd, ID_PLAY_PAUSE), FALSE);
EnableWindow (GetDlgItem (hwnd, ID_PLAY_END), FALSE);
SetFocus (GetDlgItem (hwnd, ID_PLAY_BEG));

bPlaying = TRUE;
return TRUE;

case ID_PLAY_PAUSE:
if (!bPaused)
// Pause the Play
{
mciGeneric.dwCallback = 0;

mciSendCommand (wDeviceID, MCI_PAUSE, MCI_WAIT,
(DWORD) (LPMCI_GENERIC_PARMS) &mciGeneric);

SetDlgItemText (hwnd, ID_PLAY_PAUSE, "Resume");
bPaused = TRUE;

else
// Begin Playing Again
{
mciPlay.dwCallback = hwnd;
mciPlay.dwFrom = 0;
mciPlay.dwTo = 0;

mciSendCommand (wDeviceID, MCI_PLAY, MCI_NOTIFY,
(DWORD) (LPMCI_PLAY_PARMS) &mciPlay);

SetDlgItemText (hwnd, ID_PLAY_PAUSE, "Pause");
bPaused = FALSE;
}

return TRUE;

case ID_PLAY_END:
// Stop and Close
mciGeneric.dwCallback = 0;

mciSendCommand (wDeviceID, MCI_STOP, MCI_WAIT,
(DWORD) (LPMCI_GENERIC_PARMS) &mciGeneric);

mciSendCommand (wDeviceID, MCI_CLOSE, MCI_WAIT,
(DWORD) (LPMCI_GENERIC_PARMS) &mciGeneric);

// Change Enabled Buttons
EnableWindow (GetDlgItem (hwnd, ID_RECORD_BEG), TRUE);
EnableWindow (GetDlgItem (hwnd, ID_RECORD_END), FALSE);
EnableWindow (GetDlgItem (hwnd, ID_PLAY_BEG), TRUE);
EnableWindow (GetDlgItem (hwnd, ID_PLAY_PAUSE), FALSE);
EnableWindow (GetDlgItem (hwnd, ID_PLAY_END), FALSE);
SetFocus (GetDlgItem (hwnd, ID_PLAY_BEG));

bPlaying = FALSE;
bPaused = FALSE;
return TRUE;

break;

case WM_MCI_NOTIFY:
switch (wParam)
{
case MCI_NOTIFY_SUCCESSFUL:
if (bPlaying)
SendMessage (hwnd, WM_COMMAND, ID_PLAY_END, 0);

if (bRecording)
SendMessage (hwnd, WM_COMMAND, ID_RECORD_END, 0);

return TRUE;
break;

case WM_SYSCOMMAND:
switch (wParam)
{
case SC_CLOSE:
if (bRecording)
SendMessage (hwnd, WM_COMMAND, ID_RECORD_END, 0);

if (bPlaying)
SendMessage (hwnd, WM_COMMAND, ID_PLAY_END, 0);

EndDialog (hwnd, 0);
return TRUE;
break;
}
}
return FALSE;
}

```

the playback is already paused, the button resumes play by calling `mciSendCommand` again with the `MCI_PLAY` command message.

When recording, you press the first End button to stop. This generates a `WM_COMMAND` message with `wParam` equal to `ID_RECORD_END`. The window procedure responds by calling `mciSendCommand` three times: The `MCI_STOP` command message stops recording, the `MCI_SAVE` command message transfers the sound data from the temporary file to the file specified when opening the device, and the `MCI_CLOSE`

command message deletes the temporary file and closes the device.

Playback can also be terminated by pressing the second End button. This generates a `WM_COMMAND` message with `wParam` equal to `ID_PLAY_END`. The window procedure responds by calling `mciSendCommand` twice, first with the `MCI_STOP` command message and then with the `MCI_CLOSE` command message.

Now here's a problem: Although you can manually terminate playback by pressing the End button, you may want to play the entire sound file. How does the pro-

gram know when the file has completed? That is the job of the MCI notification message.

THE MCI NOTIFICATION MESSAGE

When calling the `mciSendCommand` function with the `MCI_RECORD` and `MCI_PLAY` messages, `RECORD2` includes the `MCI_NOTIFY` flag and sets the `dwCallback` field of the data structure to the program's window handle. This causes a notification message (called `MM_MCI_NOTIFY`) to be posted to the window procedure under certain circumstances.

The documentation of the `MM_MCI-`

RECORD2.RC — **COMPLETE LISTING**

```

/*-----
RECORD2.RC resource script
-----*/

#include <windows.h>
#include "record2.h"

Record2 DIALOG 32768, 0, 152, 52
    STYLE WS_OVERLAPPED | WS_CAPTION | WS_SYSMENU | WS_MINIMIZEBOX |
    WS_VISIBLE
    CAPTION "Waveform Audio Recorder"
    {
        DEFPUSHBUTTON "Record" ID_RECORD_BEG, 28, 8, 40, 14
        PUSHBUTTON "End" ID_RECORD_END, 76, 8, 40, 14, WS_DISABLED

        PUSHBUTTON "Play" ID_PLAY_BEG, 8, 30, 40, 14, WS_DISABLED
        PUSHBUTTON "Pause" ID_PLAY_PAUSE, 56, 30, 40, 14, WS_DISABLED
        PUSHBUTTON "End" ID_PLAY_END, 104, 30, 40, 14, WS_DISABLED
    }

```

Figure 4: This resource script contains the definition of the program's window.

RECORD2.H — **COMPLETE LISTING**

```

/*-----
RECORD2.H header file
-----*/

#define ID_RECORD_BEG 10
#define ID_RECORD_END 11
#define ID_PLAY_BEG 12
#define ID_PLAY_PAUSE 13
#define ID_PLAY_END 14

```

Figure 5: The header file defines constants used in both the C code and resource script.

RECORD2.DEF — **COMPLETE LISTING**

```

;-----
; RECORD2.DEF module definition file
;-----

NAME RECORD2

DESCRIPTION 'Waveform Audio Recorder (c) Charles Petzold, 1991'
EXETYPE WINDOWS
STUB 'WINTUB.EXE'
CODE PRELOAD MOVEABLE DISCARDABLE
DATA PRELOAD MOVEABLE MULTIPLE
HEAPSIZE 1024
STACKSIZE 8192
EXPORTS DlgProc

```

Figure 6: Here is the program's module definition file.

NOTIFY message in the beta version of the MDK is not very good. It's not at all clear under what circumstances you'll receive this message. Just about the only thing that you can figure out from the documentation is that lParam is the device ID and wParam is a status code. After some experimentation, I determined the following: You'll receive an MM_MCINOTIFY message with wParam equal

to MCI_NOTIFY_ABORTED when mciSendCommand is called with the MCI_STOP or MCI_PAUSE command messages. This happens when you press the Pause button or either of the two End buttons. RECORD2 can simply ignore this case because it already properly handles these buttons.

During playback, you'll receive an MM_MCINOTIFY message with wParam equal to MCI_NOTIFY_SUCCESSFUL when the sound file has completed. To

handle this case, the window procedure sends itself a WM_COMMAND message with wParam equal to ID_PLAY_END to simulate the user pressing the End button. The window procedure then stops playing and closes the device in the usual manner.

During recording, you'll receive an MM_MCINOTIFY message with wParam equal to MCI_NOTIFY_SUCCESSFUL

when you run out of hard disk space for storing the temporary sound file. (I wouldn't exactly call this a "successful" completion, but that's what happens!) Like during playback, the window procedure responds by sending itself a WM_COMMAND message with wParam equal to ID_RECORD_END. The window procedure stops recording, saves the file, and closes the device, as normal.

However, I'm afraid that this doesn't work very well, and I hope it's because I'm still using beta software. What happens is that the temporary file is deleted and the RECORD2.WAV file is 0 bytes in length. Attempting to open the device to play back this file causes an error condition, reported by the text string "Requested file not found." Attempting to record again is a worse problem: When RECORD2 attempts to delete the file, Windows displays a "sharing violation" message box, and the device can't be opened. Indeed, even after returning to DOS, I can't delete the file and I'm forced to reboot to get rid of it.

I can't think of any way to change the program to avoid this problem, and I hope the release version of Multimedia Windows behaves more rationally.

CLEANER, BUT NOT CLEAN ENOUGH

As should be obvious, RECORD2 is a lot shorter and cleaner than RECORD1. RECORD1 had to pass memory buffers to the waveform audio driver, and then transfer the contents of these buffers to a larger buffer for storing the entire recorded sound. The program was complicated additionally by checking that the memory allocations and reallocations were successful.

RECORD2 still looks a bit grungy, though. The mciSendMessage function is defined as requiring a DWORD (unsigned 32-bit integer) as the last parameter, yet this parameter is generally a far pointer to a data structure. So, in a small model program, a pointer to the structure first has to be cast to a far pointer, and then to a DWORD. This doesn't exactly help readability of the code.

COMING UP

In the next issue, I'll discuss the alternative form of the Media Control Interface that uses text strings rather than command messages and data structures. The appearance of this code is very clean, and text-based MCI turns out to have some other advantages as well. ■

by
Ray Duncan

Power Programming

An Introduction To Pen-Based Computing

As I write this, the Fall 1991 Comdex extravaganza is upon us, and over a dozen companies are jockeying for position as they prepare to launch pen-based computers. This week's issue of *InfoWorld* contains a two-page color advertisement that is a harbinger of the marketing wars to come. The ad features a gentleman, shot in the soft focus more typically found in *Rolling Stone* and dressed according to the latest issue of *GQ*, lying prone on the carpet as he wiggles his toes in the air and peruses profit-and-loss statements on his stylish black pen computer. All absurdity aside, it's a potent illustration of the amount of money venture-capital companies are willing to throw around in the name of "mind share" and an indicator of how high the stakes are—or at least, of how high some people hope they are.

Is this the lull before the storm? Will pen computers have the dominant presence 10 years from now that DOS computers have today? Or will pen computing sputter along like CD-ROM—reasonably successful in certain vertical applications, but otherwise an expensive solution in search of a problem? I wouldn't presume to make any predictions about the fate of pen computing. My crystal ball has been broken since about the time OS/2 was introduced, and I haven't bothered to get it repaired. But the technology of pen computing is quite interesting and worthy of a few installments of this column, regardless of its ultimate fate.

How can we characterize a pen computer? The essential feature seems to be an integrated display and input device, with the keyboard relegated to an optional role. When the stylus or "pen" is applied to the pen computer's screen, the software tracks it and turns on pixels to create a visible trail—a process called *inking*. All pen computers obviously must be able to recognize printed characters in real-time or near-real-time (reliable real-time translation of cursive writing is still far beyond the state of the art), but a second hallmark of pen computers is a

■ Pen computing requires hardware-independent systems software and development tools to match. We'll begin our examination with a look at the two major contenders—PenPoint and PenWindows.

heavy reliance on *gestures*. A gesture is a stereotyped motion or mark that the system software recognizes and acts upon for editing or navigation. For example, the user might draw a line through or under text on the screen to select it (analogous to clicking and dragging with a mouse), or draw an X through a character or word in order to delete it.

THE PLAYERS AND THE PLATFORMS

Your first encounter with pen computing, if you missed Fall Comdex, is probably going to arrive in a brown truck. Since about September 1991, UPS drivers have been equipped with new notebook-size computers that have built-in bar code scanners and a pressure-sensitive liquid crystal display. When a package is delivered, the driver scans the bar code on the shipping label, then the recipient "signs for the package" by writing on the LCD with a stylus. The signature is digitized and stored along with the package's ID number from the bar code, both to be uploaded later to the package tracking and billing

applications on UPS's mainframes. UPS's adoption of this system is a pretty strong omen that there must be some substantial benefits in pen computing, because UPS is well known for the hard-nosed practicality of its business practices and the gimlet eyes of its accountants.

As a software developer, however, your interest in UPS is probably limited to its involvement with the delivery of beta test versions of the latest and greatest programming tools. If you plan to get involved with pen computing, you need a hardware-independent systems software platform and the development tools to go with it. The two major platform suppliers—and the two that seem most likely to be around for the long term—are GO Corp. with its PenPoint operating system, and Microsoft Corp. with its DOS-based Microsoft Windows for Pen Computing environment, commonly referred to as PenWindows. Virtually every company that is building or planning to build a general-purpose pen computer is hedging its bets by striving for compatibility with both of these software platforms.

The approaches taken by GO and Microsoft are fascinatingly different. GO Corp. stresses the need for a clean break with the past: PenPoint is a completely new, portable, 32-bit object-oriented operating system, and GO's developers have discarded the Xerox PARC windowing/desktop metaphor in favor of a new graphical user interface model called the Notebook User Interface (NUI). Applications have to be designed and written from scratch for PenPoint; a programmer's prior experience with GUI applica-

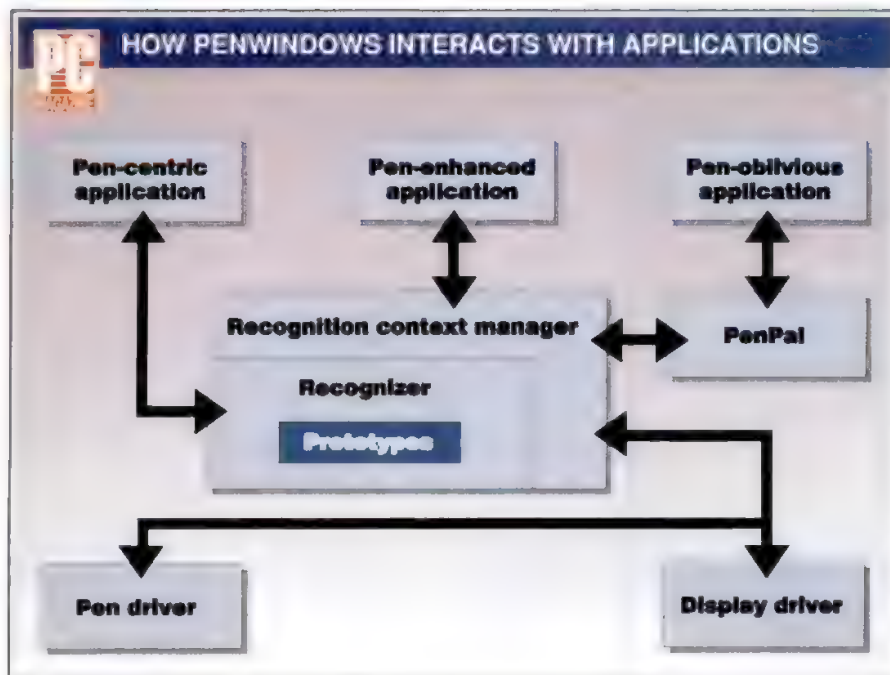


Figure 1: This illustrates the relationship between the pen-specific modules of PenWindows and pen-oblivious, pen-enhanced, and pen-centric applications.

tion development will be of only the most general assistance.

Microsoft, on the other hand, stresses the need for "compatibility." PenWindows is an extension to Microsoft's extremely successful Windows 3.x product, consisting mainly of some additional DLLs and device drivers, and it can run existing Windows applications perfectly well in addition to new applications that have been specifically designed with pen computing in mind.

Which company is right? Probably both, for now. There's a clear need for a more powerful user interface metaphor; the desktop metaphor starts to break down when you get a few hundred icons and folders floating around, just as the command line metaphor ran out of gas when users had to remember more than 10 or 20 commands. But there's also a pressing need to preserve users' investments in software, especially since many companies are currently going through multimillion-dollar conversions from command line or character-based DOS applications to Windows-based applications, and can't afford to make another such conversion for 5 to 10 years.

Thus, it's safe to bet that in the near term, Microsoft will get the lion's share of the pen computing market, because of

the ease with which existing Windows applications can be used unchanged on a pen computer or made pen-aware. But in the long term, I wouldn't bet against GO Corp. acquiring a significant chunk of the market. If a system is flexible enough, powerful enough, and intuitive enough, it will wear down the competition and eventually prevail (or the competition will converge on its features in order to survive). And the talents behind GO Corp. are formidable: they include Robert Carr (au-

thor of *Framework*), S. Jerrold Kaplan (coauthor of *Lotus Agenda*), and William V. Campbell (previously president and CEO of Claris and before that vice president of Apple Computer).

I hope to be able to cover PenPoint and its development tools in detail in a later Power Programming or Lab Notes column, but I've already seen enough of the system to know that it is seductively elegant. A computer running GO's PenPoint is *instant-on* and extremely responsive, because the entire system is RAM-based. When an application is installed, it is relocated once and always runs at the same address until the user decides to deinstall it. This eliminates the overhead of all the relocation information that usually accompanies disk-based programs.

Other significant features of PenPoint include portability (the system is written entirely in a high-level language and takes full advantage of 32-bit architectures), scalability (for example, it assumes no particular display size and can use any amount of RAM up to 4 gigabytes), built-in support for hyperlinks that can be created between arbitrary data items with a single gesture, integrated networking and multitasking, *live embedding* that is far more powerful than Microsoft's OLE, and aggressive *modelessness*—the user has no perception of an operating system or applications in any traditional sense, only of the contents of his notebook.

If you are interested in learning more about PenPoint in a hurry, you can attend a one-day technical seminar at GO Corp. for \$95 or a four-day programming workshop for \$2,000. Contact developer services at GO Corp., 950 Tower Ln., 14th

Figure 2: PenWindows with the PenPal floating palette in the lower right corner.



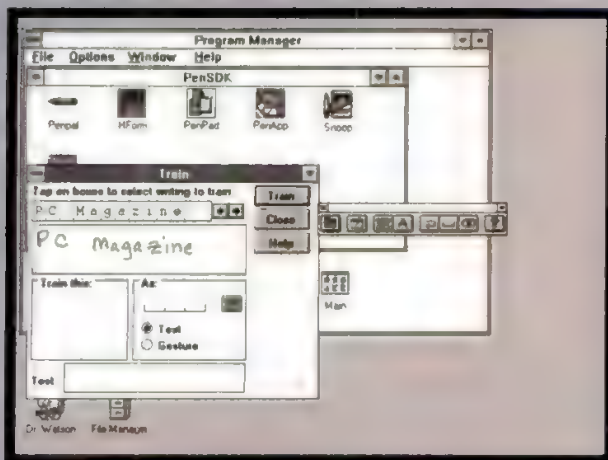


Figure 3: The Trainer module of PenPal, which allows you to train the PenWindows writing Recognizer module for your own handwriting.

Floor, Foster City, CA 94404 for schedules and a registration form. A less expensive alternative is *The Power of PenPoint*, by Robert Carr and Dan Shafer, Addison-Wesley Publishing, Reading, Mass., 1991, \$22.95, ISBN 0-201-57763-1.

MICROSOFT'S PENWINDOWS

Let's turn our attention to Microsoft's PenWindows now. Although it will no doubt be a distinct product in the near future, PenWindows is currently available only as part of the PenWindows Software Development Kit (SDK) and requires the beta version of Windows 3.1 to operate. The PenWindows SDK is installed "on top of" the Windows 3.1 beta retail release and Windows 3.1 beta SDK, and requires about 3MB of additional disk space if you elect to copy all of the example applications, help files, and other optional components onto your system. The current version of the SDK supports VGA-resolution integrated display/stylus input devices from Wacom and Scriptel, but also has a special Microsoft Mouse driver that emulates pen input. The driver is highly unsatisfactory for anything but the crudest experiments, though; "writing" with the mouse is hideously slow and feels very unnatural.

After you install PenWindows, you activate it by backing up your old SYSTEM.INI and CONTROL.INI files from the C:\WINDOWS directory to a safe place, and then renaming the files SYSTEM.PEN and CONTROL.PEN to

SYSTEM.INI and CONTROL.INI respectively. These files contain statements that load the appropriate input drivers for the stylus or mouse, pointers to replacement display drivers that support inking, and the filenames and locations for other critical PenWindows components such as the Recognizer module and its dictionaries. You can return to normal (that is, mouse- and keyboard-driven) Windows operation simply by copying your original SYSTEM.INI and CONTROL.INI files back to C:\WINDOWS and rebooting Windows.

PenWindows supports three classes of applications:

- *Pen-oblivious* applications, which know nothing of special PenWindows capabilities or edit controls;

- *Pen-enhanced* applications, which test for the existence of PenWindows and modify their user interface accordingly (for example, substituting special handwriting edit controls for the usual edit controls in dialogs when running under PenWindows instead of normal Windows); and

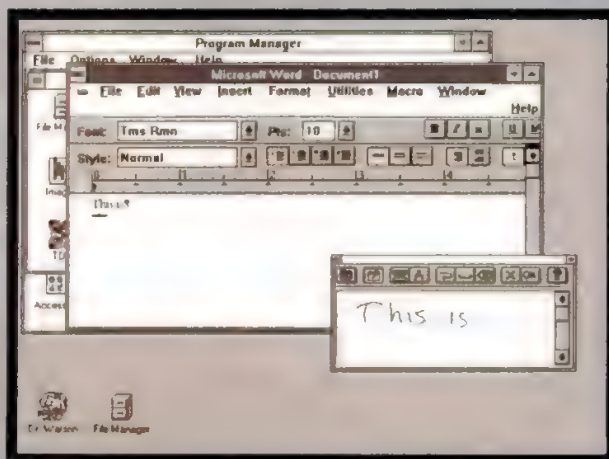
- *Pen-centric* applications, which support the capture and recognition of written input and gestures directly and are totally pen-dependent.

The relationship between these pen-specific components of PenWindows and the various classes of applications is shown in Figure 1, which was adapted from Microsoft's PenWindows SDK manual.

PenWindows supports pen-oblivious applications through a utility called PenPal. When you start up PenWindows, PenPal is automatically launched as well, and shows up on the screen as a small floating palette of buttons, as shown in Figure 2. From left to right, the first four buttons activate the PenPal options menu, a pop-up writing window, a pop-up keyboard, and a trainer window that allows you to adapt the PenWindows Recognizer module to your own handwriting, as shown in Figure 3. The remaining buttons correspond to the Enter, Spacebar, and Backspace keys, and the final button brings up the PenPal on-line help window.

Figure 4 shows how you can use PenPal's pop-up writing window to work with an existing keyboard- and mouse-oriented application. When the writing window is activated, you can write in it with the stylus, watch as it converts the written characters to text, and then edit the text (if necessary) with gestures and additional

Figure 4: Using PenPal with a pen-oblivious application. Words written in the window are translated to characters, which can then be edited. The final text can be shipped to the application by tapping the OK button.



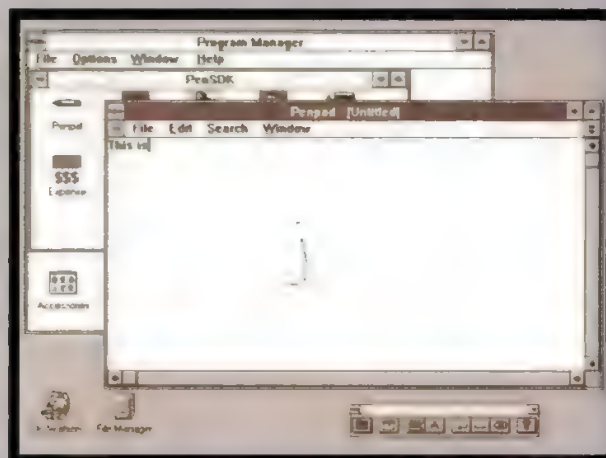
characters. When you tap the OK button, the string of characters is fed to the application as a series of ordinary keyboard character messages. Figure 5 shows the other option for dealing with existing Windows applications: the PenPal pop-up keyboard. You merely tap the key icons on the floating keyboard with the stylus, and they are immediately fed to the application just as though they had been typed on the keyboard.

The PenWindows SDK also contains several sample pen-enhanced and pen-centric applications. For example, there is a pen-centric version of NotePad called PenPad, which allows you to write directly in its editing window. In Figure 6, I am in the process of writing the sentence "This is just a test" in PenPad, and it is translating the characters one at a time (you can see the translated text in the upper-left corner of PenPad's window, and the most recently written character *j* near the center of the window).

Other demonstration applications include HFORM, which illustrates the use of PenWindows' various handwritten edit controls, and EXPENSE, which is a prototype application for handwritten entry of traveling expenses such as hotel bills and bridge tolls. The PenWindows SDK also includes some debugging aids, such as PenApp and Snoop, which allow you to watch the Recognizer in action.

In the next issue of *PC Magazine*, we'll discuss the components of PenWindows in more detail, compare the various available integrated display/stylus devices that are supported by the PenWindows SDK, and survey the PenWin-

Figure 6: The PenPad application shipped in the PenWindows SDK, which is a pen-centric clone of the more familiar NotePad application. Here we are writing the words "This is just a test" directly in the PenPad editing window.



dows application programming interface (API) and its new controls.

DOS 5.0 CORRECTION

In the October 29, 1991, issue of *PC Magazine*, I discussed some of the new function calls available in DOS 5.0 including, in particular, the "Get True Version" call (INT 21h function 3306h). This function is essential if your program wants to take advantage of DOS 5.0 capabilities, because the user can tell DOS with the SETVER command to lie to your program (for whatever reason) when the "old" Get Version function (INT 21h function 30h) is called.

Unfortunately, my description was incorrect in that INT 21h function 3306h

does not return the Carry flag set on earlier versions of DOS. On DOS 3.3, for example, INT 21h function 3306h returns with the Carry flag clear and AX = 33FFh. So far, it looks as if the best strategy is to zero out the BX register, call INT 21h function 3306h, check if BX has changed, and if not, call the old Get Version function instead. For example:

```
xor    bx,bx
mov    ax,3306h
int    21h
or     bx,bx
jz     L1 ;jump, not DOS 5+
.
L1:    mov    ax,3000h
int    21h
or     al,al
jns    L2 ;jump, not DOS 1.x
.
```

Note that you must clear the lower byte of AX before calling INT 21h function 3000h, because this function isn't supported on DOS 1.x systems, and you don't want to be misled by any residual data that might be in AL at the time of the call.

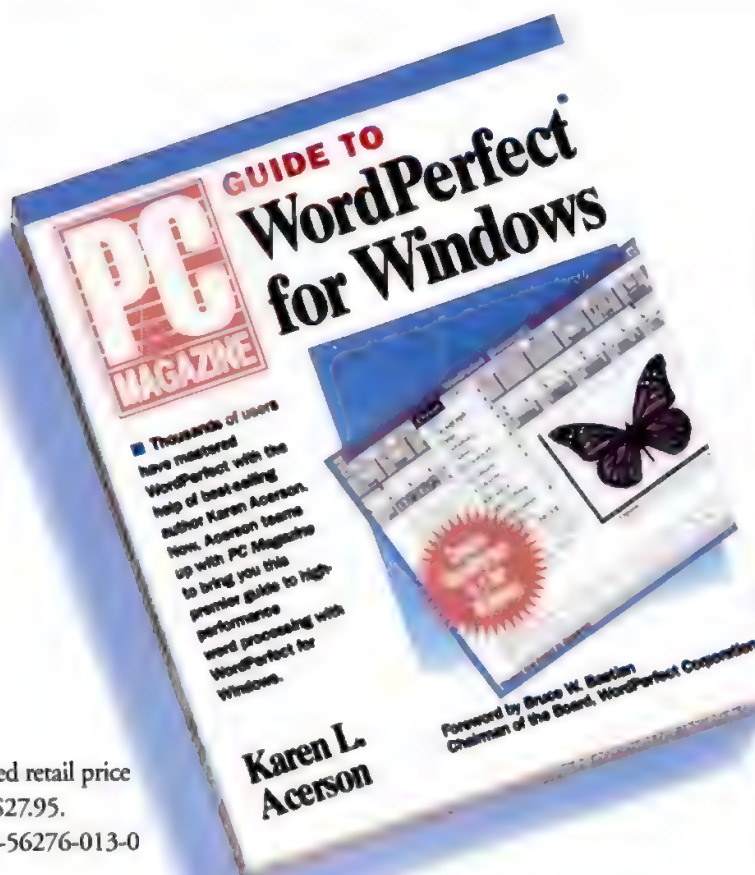
THE IN-BOX

Please send your questions, comments, and suggestions to me at any of the following electronic mail addresses:
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Figure 5: Using the PenPal pop-up keyboard window with a pen-oblivious application. Tapping the key icons with the stylus results in keyboard character messages that are sent to the application just as though they had been entered at the keyboard.

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by
Sal Ricciardi

Databases

HIDDEN HOT SPOTS

I recently discovered something new in Version 1.02 of *FoxPro*. When you select the About *FoxPro*... option from the System menu, the window that appears contains two hidden hot spots. You must select one within 10 seconds, after which the window disappears.

The two hot spots are located in the top left and top right corners of the window and are two columns wide and two rows high. If you position the mouse cursor on the left hot spot and click the left mouse button, a list of *FoxPro*'s authors will scroll by from right to left. If you position the mouse cursor on the right hot spot and click the left button, you will see a similar list of names for *FoxPro*'s documentation team.

I was so impressed with the hidden hot spots and the horizontal scrolling, that I figured out how to provide similar functions, which I can use in my own *FoxPro* applications.

ABOUT.PRG (shown in Figure 1) produces a window containing some text that displays for 10 seconds. If, during that time, you click just inside the top left corner of the window, a message will continuously scroll across the window until a key or a mouse button is pressed.

Vincent Harris
Fremont, California



FoxPro's developers deserve a lot of credit. Using Mr. Harris's discovery, you can see a list of their names.

The sample listing illustrates how to detect mouse clicks in *FoxPro* and how to scroll a message horizontally across a window. I modified the code slightly to convert the old "store a to b" format assignments to "a = b" format, to eliminate some redundancies, and to customize the text.

When you run ABOUT.PRG, a window with some text in it appears. You then have 10 seconds to click the mouse in the upper left corner. When you do, the



message "**** PC Magazine Databases ****" begins scrolling across the window from left to right. The result is shown in Figure 2.

To detect a left mouse click, you use the INKEY() function. In the sample program, the line

```
-INKEY(10, "M")
```

tells *FoxPro* to wait up to 10 seconds for an input event to occur. The "M" tells *FoxPro* to detect mouse clicks as well as keystrokes. When a left mouse click occurs, the INKEY() function returns the special value 151.

The MROW() and MCOL() functions determine where the mouse was positioned when it was clicked. MROW() returns the screen row position of the mouse cursor and MCOL() returns the column position. The positions are relative to the active window if there is one, or to the screen otherwise. If the mouse is clicked outside the active window, the functions return -1.

To create a hidden hot spot in the About box, all you have to do is look for

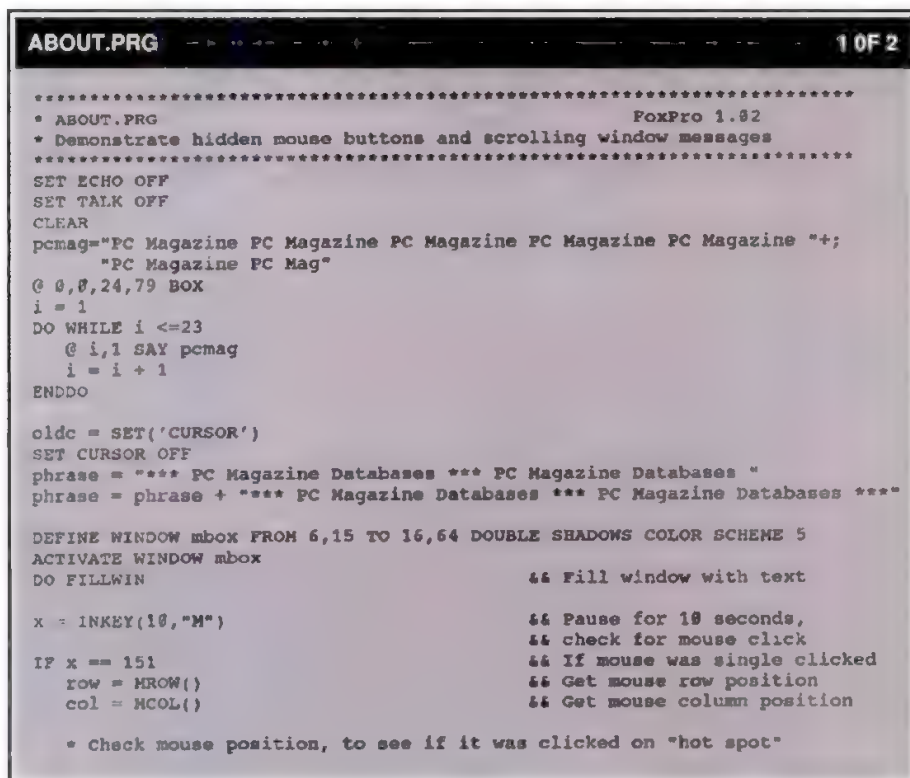


Figure 1: ABOUT.PRG shows how to include invisible buttons in your programs and scroll a message horizontally across a window.

ABOUT.PRG

2 OF 2

```
IF row < 2 .AND. col < 2 .AND. row <> -1 .AND. col <> -1

width = WCOLS()          ** Get width of the window

* If phrase is shorter than window width, pad it with spaces

IF LEN(phrase) < width
  phrase = LEFT(phrase + SPACE(width), width)
ENDIF
midrow = INT(WROWS()/2)   ** Pick the middle row

DO WHILE .T.
  @ midrow-1,0 SAY SPACE(width) COLOR W+/R
  @ midrow +1,0 SAY SPACE(width) COLOR W+/R
  @ midrow, 0 SAY LEFT(phrase,width) COLOR W+/R

  phrase = SUBSTR(phrase,2) + LEFT(phrase,1)  ** Move front to back

  delay = INKEY(.1,"M")      ** Short delay, get click or key
  IF delay != 0               ** Quit with any keypress or click
    DO FILLWIN
    EXIT
  ENDIF
ENDDO
ENDIF

RELEASE WINDOW mbox          ** Release the window
SET CURSOR to ldc           ** Restore cursor setting CLEAR
RETURN

PROCEDURE FILLWIN
CLEAR
@ 1,16 SAY "The About Box"
@ 3,8 SAY "Can you find the hot spot?"
@ 5,17 SAY "PC Magazine"
@ 7,19 SAY "Databases"
RETURN
```

mouse clicks where the row and column positions returned by MROW() and MCOL() are within the hidden region (in this particular case, less than 2 and not equal to -1).

To understand how to display a text message with a scrolling effect, think of

the text string itself as a queue. A queue is a data structure in which items are added to the rear of the queue and removed from the front. This creates a first-in-first-out effect.

Let's say the message you wish to scroll is "Copyright ". If you consider

each character in the message an item, and the entire message a queue, the queue looks like this:

```
Head
|
"Copyright "
|
Tail
```

To scroll the message, you take one character from the head of the queue and add it to the tail:

```
Head
|
"opyright C"
|
Tail
```

The next time you scroll, the result looks like this:

```
Head
|
"pyright Co"
|
Tail
```

and so on. For each scroll, you reconstruct the string and display it, overwriting the previous display. The line in the sample program that is responsible for building the string is

```
phrase = SUBSTR(phrase,2) +
LEFT(phrase,1)
```

This produces the left-to-right scrolling effect. If you want the message to scroll in the opposite direction, you could use this line:

```
phrase = RIGHT(phrase,1) +
LEFT(phrase,LEN(phrase)-1)
```

as a substitute.

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Figure 2: Using the techniques illustrated in Figure 1, you can create horizontal scrolling messages that are activated by a hot spot.

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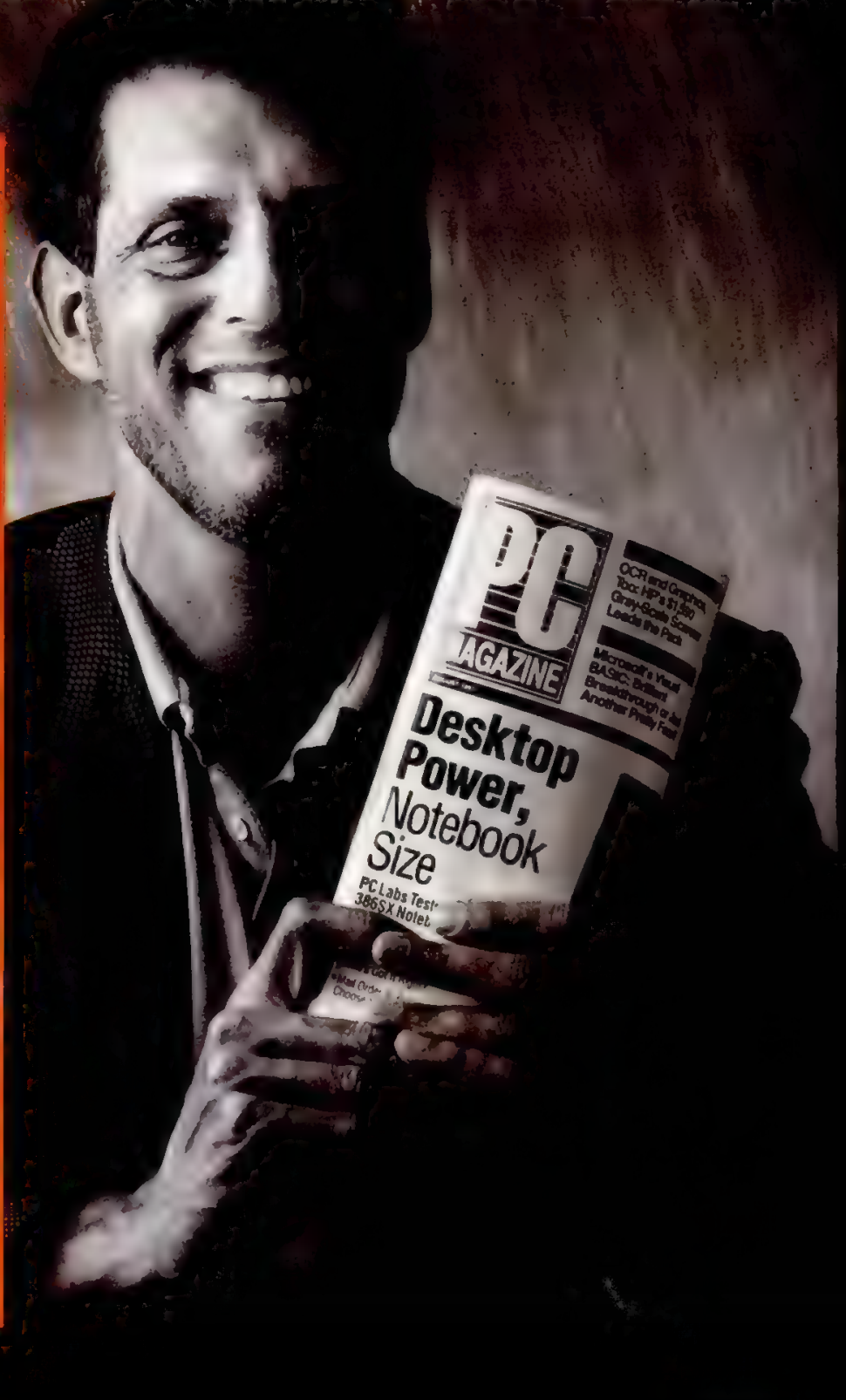
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Languages

ENVIRONMENT INPUT

I wrote a program that I think is much better than *PC Magazine's* GETKEY.COM or *Norton's* ASK utilities. Neither of these two programs gives you access to the function keys or the cursor control keys, but my program, INKEY.PAS (shown in Figure 1), does. It also waits (if the keyboard buffer is empty) for you to press a key. Then it stores information about which key is pressed in an environment variable called KEY.

INKEY uses the subroutines and defensive programming techniques discussed in the November 28, 1989, Lab Notes column. It recognizes every key that Turbo Pascal recognizes, as far as I

■ **ENVIRONMENT INPUT:**
Here's a Turbo Pascal utility that puts user input into the environment.

know. The program will return ERR for keys entered using the Alt key and the number pad if you type a number greater than 127. And it stores a value in the environment variable KEY to identify which key was pressed: s means Shift, ^ means Ctrl, a means Alt. My program also con-

tains the subroutines specialDos, getDosPSP, and getEnv mentioned in that same issue of Lab Notes.

Don't run INKEY from the integrated development environment; you must first compile it into an executable file and then execute it to test it. You can execute the file from the operating system shell to test it, though. In addition, since the program makes changes in memory, you should make sure the program is entered correctly before executing it. INKEY is case-sensitive. However, if you use a /U parameter, INKEY returns uppercase letters for upper- and lowercase letters.

L. Martin Schmiede
Clute, Texas

```
INKEY.PAS
(SD-,L-,R-,S-)
PROGRAM inkey;
USES CRT, DOS;

TYPE
  string2 = String[2];
  errortype = (none, envNotFound, invalidEnv, envTooSmall);

VAR
  envinUse : Word;      (bytes in environment up to 1st double 0)
  envPos   : Word;      (location of KEY in environment)
  envSeg   : Word;      (address of environment)
  envSize  : Word;      (maximum size of environment)
  error    : errortype;  (errors finding environment)
  newKey   : String;     (new value for KEY)
  oldKey   : String;     (KEY when initially run if any)
  paramFound : Boolean;  (if the parameter /u is in command line)

CONST
  topRow : String[10] = 'QWERTYUIOP';
  midRow : String[10] = 'ASDFGHJKL';
  botRow : String[10] = 'ZXCVBNM';
  numbers : String[10] = '1234567890';

FUNCTION specialDos : Boolean;
VAR Verswap : Word;
BEGIN
  Verswap := 198 - Lo(DosVersion) + Hi(DosVersion);
  specialDos := (Verswap > 319) AND (Verswap < 338);
END;

FUNCTION getDosPSP : Word;
VAR i : Integer;
    tent : Word;
    tent1 : Word;
BEGIN
  i := 0;
  tent := MemW[PrefixSeg:$16];
  (Parent process's PSP is at offset $16)
  WHILE error = none DO
    BEGIN
      tent1 := MemW[tent:$16];
      i := i + 1;
      IF ((tent1 = 0) OR (tent1 = tent)) THEN
        (if this PSP is its own parent...)
        BEGIN
          getDosPSP := tent;
          Exit;
        END;
      ELSE tent := tent1;
      IF i = 0 THEN error := envNotFound;
      (try to find the root shell 0 times)
    END;
  END;

END;

PROCEDURE getEnv;
VAR DosPSP, temp : Word;
BEGIN
  DosPSP := getDosPSP;
  temp := MemW[DosPSP:$2C];
  IF ((temp <> 0) AND (NOT specialDos)) THEN
    envSeg := temp
  ELSE envSeg := DosPSP + MemW[DosPSP-1:3]*1;
  (calculate envSeg by adding SIZE of command shell to
  its starting address. DosPSP-1 is address of MCB
  corresponding to shell, and size is at offset 3)
  envSize := 16*MemW[envSeg-1:3];
END;

PROCEDURE validate;
(Verifies the address determined by getEnv is
correct by comparing the contents of the possible
environment to those in the program environment)
VAR
  i : Integer;
  j : Word;
  k : Integer;
  envName : String[255];
BEGIN
  j := 0;
  k := 1;
  WHILE (Mem[envSeg:j] > 0) AND (error = none) AND (j < envSize) DO
    BEGIN
      i := 1;
      IF k <= ENVCOUNT THEN
        BEGIN
          envName := ENVSTR(k);
          IF Copy(envName, 1, 4) = 'KEY=' THEN
            BEGIN
              oldKey := envName;
              envPos := j;
            END;
        END;
      ELSE error := invalidEnv;
      WHILE (Mem[envSeg:j] > 0) AND
        (error = none) AND
        (j < envSize) DO
        BEGIN
          IF i < 256 THEN
            (it is theoretically possible for an
            environmental variable to be longer
            than 255 characters,
            IF (Char(Mem[envSeg:j]) <> envName[i]) THEN
              error := invalidEnv;
          i := i + 1;
        END;
    END;
  END;
```

Figure 1: The INKEY program takes keyboard input and translates it to a descriptive environment string.


```

1 := 1;
END;
j := j+1;
k := k+1;
END;
envinUse := j+1;
IF envinUse > envSize THEN error := invalidEnv;
END;

PROCEDURE changeEnv;
(adds KEY to the environment if there is enough room )
( or changes KEY if it already exists and there is )
( enough room )
VAR
diff : Integer;
j : Integer;
BEGIN
IF oldKey = '' THEN (if KEY does not exist already)
BEGIN
IF envinUse + Length(newKey)+1 <= envSize THEN
( if there's room )
BEGIN
( add KEY to the environment )
envPos := envinUse-2; (add KEY before the first 0 if KEY)
IF envPos > 0 THEN ( is the only variable in the )
envPos := envPos+1; ( environment, after if it isn't )
FOR j := 0 TO Length(newKey)-1 DO
Mem[envSeg:envPos+j] := Ord(newKey[j+1]);
Mem[envSeg:envPos+Length(newKey)] := 0;
END;
ELSE error := envTooSmall;
END;
ELSE (if KEY already exists)
BEGIN
diff := Length(newKey)-Length(oldKey);
IF envinUse+diff+1 <= envSize THEN (if there's room)
BEGIN
IF diff = 0 THEN (if the KEY is the same length)
BEGIN
( change the value of KEY )
FOR j := 0 TO Length(newKey)-1 DO
Mem[envSeg:envPos+j] := Ord(newKey[j+1]);
END;
IF diff < 0 THEN (if the new KEY is shorter, change)
BEGIN
( change the value of KEY, then )
( move environment past KEY back )
FOR j := 0 TO Length(newKey)-1 DO (to end of KEY)
Mem[envSeg:envPos+j] := Ord(newKey[j+1]);
FOR j := envPos+Length(oldKey) TO envinUse-1 DO
Mem[envSeg:j+diff] := Mem[envSeg:j];
END;
IF diff > 0 THEN (if the new KEY is longer, move )
BEGIN
( the environment past the end of )
( KEY forward, then change the )
( value of KEY )
FOR j := envinUse-1 DOWNTO envPos+Length(oldKey) DO
Mem[envSeg:j+diff] := Mem[envSeg:j];
FOR j := 0 TO Length(newKey)-1 DO
Mem[envSeg:envPos+j] := Ord(newKey[j+1]);
END;
ELSE error := envTooSmall;
END;
END;
END;
END;

FUNCTION key : String;
VAR keyTyped : String2;
(returns the value to be stored in environment)
BEGIN
keyTyped[1] := READKEY;
IF keyTyped[1] = #0 THEN keyTyped[2] := READKEY;
CASE keyTyped[1] OF
#8 : key := 'BACK'; (sBACK, 'H')
#9 : key := 'TAB'; ('I')
#10 : key := 'ENTER'; ('J')
#13 : key := 'ENTER'; (sENTER, 'M')
#1..#26 : key := '+' + Chr(64+Ord(keyTyped[1])); ('A to 'Z)
#27 : key := 'ESC'; (sESC, '[]')
#28 : key := '';
#29 : key := '';

```

```

#30 : key := '6';
#31 : key := '-';
#32 : key := 'SPACE';
#97..#122 : IF paramFound THEN (lowercase letters)
key := Chr(Ord(keyTyped[1])-32) (to uppercase);
ELSE key := keyTyped[1]; (leave in lowercase);
#127 : key := 'BACK';
#33..#126 : key := keyTyped[1];
#8 : CASE keyTyped[2] OF
#3 : key := '2';
#15 : key := 'TAB';
#14..#25 : key := 'a'+topRow[Ord(keyTyped[2])-15];
#36..#39 : key := 'a'+midRow[Ord(keyTyped[2])-29];
#44..#50 : key := 'a'+botRow[Ord(keyTyped[2])-43];
#59..#67 : key := 'F'+numbers[Ord(keyTyped[2])-50];
#68 : key := 'F10';
#71 : key := 'HOME';
#72 : key := 'UP';
#73 : key := 'PGUP';
#75 : key := 'LF';
#77 : key := 'RT';
#79 : key := 'END';
#88 : key := 'DN';
#81 : key := 'PGDN';
#82 : key := 'INS';
#83 : key := 'DEL';
#84..#92 : key := 'aF'+numbers[Ord(keyTyped[2])-83];
#93 : key := 'aF10';
#94..#102 : key := 'F'+numbers[Ord(keyTyped[2])-93];
#103 : key := 'F10';
#104..#112 : key := 'aF'+numbers[Ord(keyTyped[2])-103];
#113 : key := 'aF10';
#114 : key := 'a';
#115 : key := 'LF';
#116 : key := 'RT';
#117 : key := 'END';
#118 : key := 'PGDN';
#119 : key := 'HOME';
#120..#129 : key := 'a'+numbers[Ord(keyTyped[2])-119];
#130 : key := 'a';
#131 : key := 'a';
#132 : key := 'PGUP';
ELSE key := 'ERR';
END;
ELSE key := 'ERR';
END;
END;

PROCEDURE findParam;
(determines whether the /u parameter was used)
VAR i : Word;
BEGIN
paramFound := False;
IF ParamCount > 0 THEN
FOR i := 1 TO ParamCount DO
IF (ParamStr[i] = '/U') OR (ParamStr[i] = '/u') THEN
paramFound := True;
END;
END;

error := envNotFound;
oldKey := '';
getEnv;
findParam;
IF error = none THEN
BEGIN
validate;
IF error = none THEN
BEGIN
newKey := 'KEY'+key;
IF error = none THEN changeEnv;
END;
END;
IF error = envNotFound THEN
WriteLn('ERROR -- Environment not found');
IF error = invalidEnv THEN
WriteLn('ERROR -- found something...but not the environment');
IF error = envTooSmall THEN
WriteLn('ERROR -- Environment is too small');
END;

```



Most batch file utilities for key-stroke input simply translate keys into ERRORLEVEL values. INKEY isn't limited to the 255 possible ERRORLEVELS; it puts a string describing the pressed key directly into the environment. You can use that description again and again, or copy it for later use. For example:

```

@ECHO OFF
ECHO Press Alt-P, then Alt-C
INKEY

```

```

SET OldK=%key%
INKEY
IF '%OldK%'%key%'=='aPaC' GOTO OK
ECHO Wrong!
:OK

```

However, parts of INKEY.PAS are more complex and arcane than they need to be. The program makes use of the DOS data structures for the Program Segment Prefix (PSP) and memory control blocks (MCBs) without making it clear that it's doing so. By making these data structures

explicit, we can greatly improve the program's readability.

Every running program has a PSP, and among the many data fields of a PSP are the PSP of the program's parent (the program that executed *this* program) and the segment address of the program's environment. The unit in Figure 2 defines a Pascal data structure corresponding to the PSP. By following the chain of ParentPSP fields until we come to a PSP that is its own parent, we find the active command processor. With this in mind,

we can write a clarified version of the getDosPSP function:

```
FUNCTION getDosPSP : PspPtr;
VAR
  P : PspPtr;
  i : Integer;
BEGIN
  i := 0;
  P := Ptr(PrefixSeg, 0);
  WHILE (P^.ParentalPSP <> Seg(P^))
    AND (i < 8) DO
    BEGIN
      P := Ptr(P^.ParentalPSP, 0);
      Inc(i);
    END;
  IF P^.ParentalPSP <> Seg(P^) THEN
    error := envNotFound
  ELSE GetDosPSP := P;
END;
```

This function sets a PspPtr to our program's own PSP, located at the segment stored in the built-in variable PrefixSeg. It then repeatedly sets the pointer to its own ParentalPSP, stopping when the current PSP is its own parent, or when eight loops have been completed.

In a similar fashion, the data structure in Figure 3 defines the DOS memory control block structure. Every block of

memory, be it a PSP, an environment, or a free block, is preceded by a 16-byte MCB. For our purposes, the important fields of an MCB are the Size and Owner fields. Rather than use the cryptic MemW[DosPSP-1:3], our improved GetEnv function will simply refer to the Size field of the appropriate MCB.

```
PROCEDURE getEnv;
VAR
  DosPSP : PspPtr;
  M : McbPtr;
BEGIN
  DosPSP := getDosPSP;
  IF error <> none THEN Exit;
  M := Ptr(Seg(DosPSP^)-1, 0);
  (M now points to PSP's MCB)
  EnvSeg := DosPSP^.EnvSeg;
  IF (EnvSeg = 0) OR
    specialDos THEN
    EnvSeg := Seg(DosPSP^) +
      M^.Size + 1;
  M := Ptr(EnvSeg-1, 0);
  (M now points to env.'s MCB)
  envSize := 16*M^.Size;
  IF M^.Owner <> Seg(DosPSP^) THEN
    error := InvalidEnv;
  END;
```

TYPMCB.PAS - COMPLETE LISTING

```
UNIT TypMcb;
{Memory Control Block}
(**) INTERFACE (**)
TYPE
  McbPtr = ^McbType;
  McbType = RECORD
    Type : Char;
    Owner : Word;
    Size : Word;
    unused : ARRAY[1..3] OF Char;
    Dos4Name : ARRAY[1..8] OF Char;
  END;
(**) IMPLEMENTATION (**)
END.
```

Figure 3: DOS memory control blocks (MCBs) have the same structure as the data type defined in this unit.

After we've found the Program Segment Prefix of the active command processor, we must look for its environment. Our first choice is the EnvSeg field of that PSP. However, if that field contains 0, or if the DOS version is 3.2, we have to calculate the location of the environment block, which immediately follows the active command processor itself. In order to do that, we start with the segment address of the PSP and add its size (from the MCB) plus 1.

One way or another, we have the segment address of the active environment. We now set the variable M to point to the corresponding MCB; the environment's size is 16 times the Size field of that MCB. Finally we check to make sure that this memory block actually belongs to the active command processor by comparing its Owner field with the segment address of the command processor. They should be the same, because the PSP "owns" its environment.

If you would like to update Mr. Schmiede's INKEY to use these handy data structures, just replace programs GetDosPSP and GetEnv with the functions above, and then add TypPsp and TypMcb to the USES clause.

—Neil J. Rubenking

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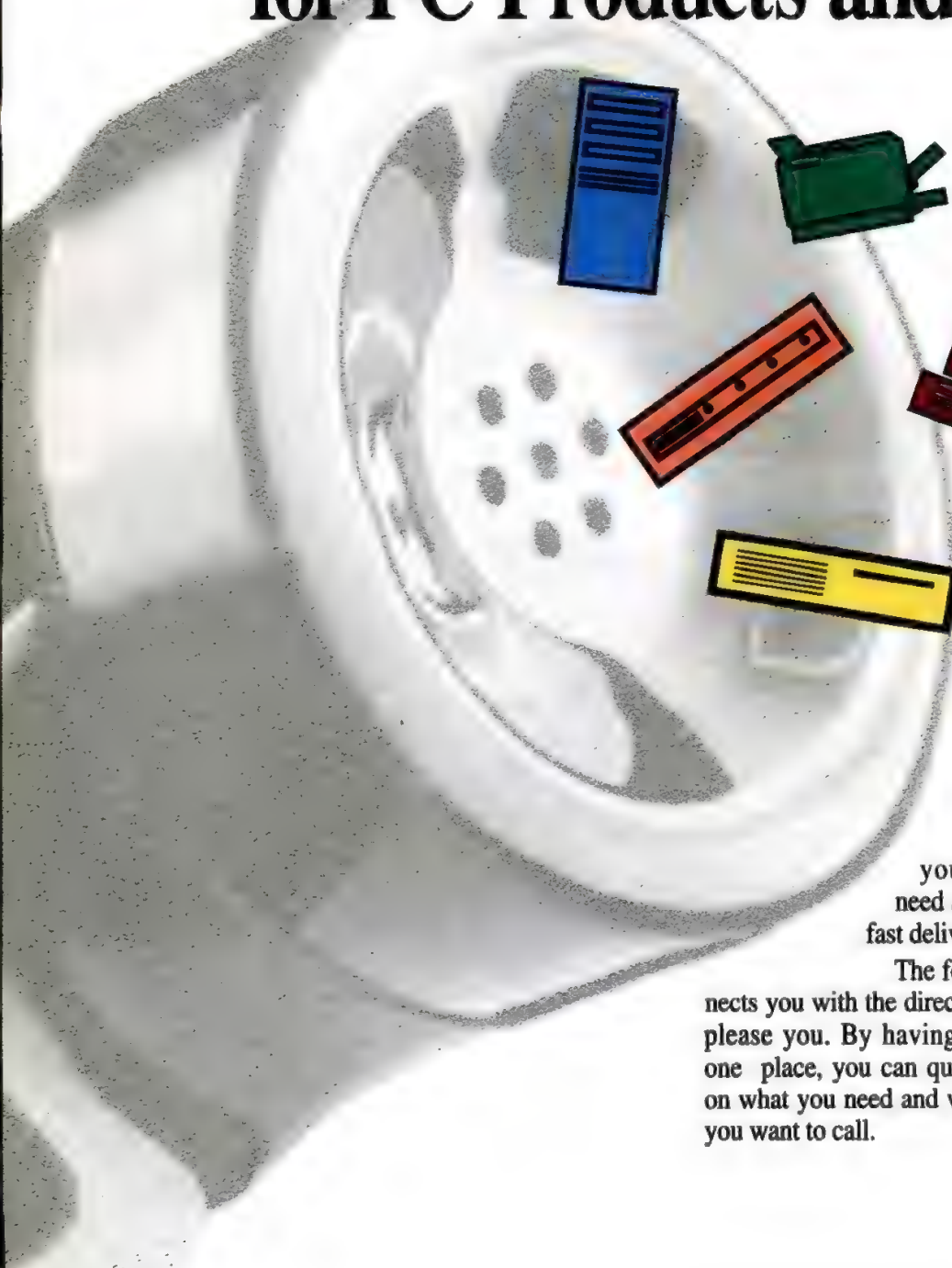
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TYPSP.PAS - COMPLETE LISTING

```
UNIT TypPsp;
{Program Segment Prefix}
(**) INTERFACE (**)
TYPE
  PspPtr = ^PspType;
  HanTable = ARRAY[0..255] OF Byte;
  HanTablePtr = ^HanTable;
  String127 = String[127];
  PspType = RECORD
    Int20 : Word;
    Unused1 : Word;
    Filler : Byte;
    Int21CPM : ARRAY[0..4] OF Byte;
    Int22,
    Int23, Int24 : Pointer;
    ParentalPSP : Word;
    Handles : ARRAY[0..19] OF Byte;
    EnvSeg : Word;
    SavedSSSP : LongInt;
    NumHandles : Word;
    HandleTablePtr : HanTablePtr;
    SharePSP : Pointer;
    Unused2 : ARRAY[0..$13] OF Byte;
    Int21b : Word;
    RetF : Byte;
    Unused3 : ARRAY[0..8] OF Byte;
    FCB1, FCB2 : ARRAY[0..15] OF Byte;
    whoknows : ARRAY[0..3] OF Byte;
    CommandTail : String127;
  END;
(**) IMPLEMENTATION (**)
END.
```

Figure 2: This unit defines a Pascal data structure that corresponds to the structure of the DOS Program Segment Prefix (PSP).

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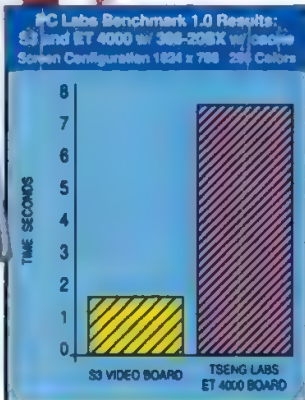
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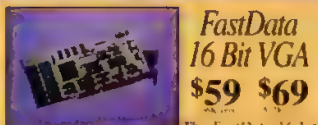
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Serial with Windows.....	147
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Ethernet.....	209
Ethernet Additional Stations.....	209
Eagle	
NE2000 2 Station NW Lite Kit.....	459
FastData NE2000 16 bit 10-BaseT.....	109
Novell	
Netware Lite.....	65

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Diamond Scan 16L.....	919
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Multisync 4FG.....	749
Orchid	
ProDesigner IIs 1mb.....	219
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P3200 24 Pin.....	269
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Okidata	
Okilaser 400.....	669

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Star	
NX1001.....	149
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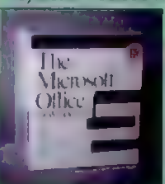
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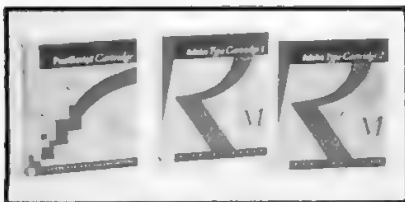
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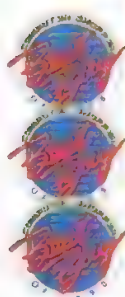
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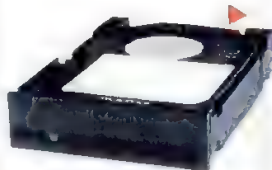
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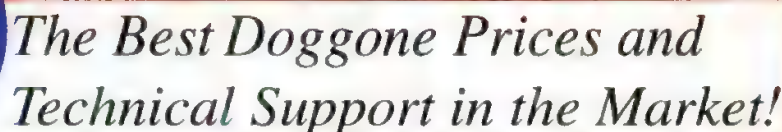
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Accounting 3.1.11	40	Accounting 3.1.14	100
Accounting 3.1.12	40	Accounting 3.1.15	100
Accounting 3.1.13	40	Accounting 3.1.16	100
Accounting 3.1.14	40	Accounting 3.1.17	100
Accounting 3.1.15	40	Accounting 3.1.18	100
Accounting 3.1.16	40	Accounting 3.1.19	100
Accounting 3.1.17	40	Accounting 3.1.20	100
Accounting 3.1.18	40	Accounting 3.1.21	100
Accounting 3.1.19	40	Accounting 3.1.22	100
Accounting 3.1.20	40	Accounting 3.1.23	100
Accounting 3.1.21	40	Accounting 3.1.24	100
Accounting 3.1.22	40	Accounting 3.1.25	100
Accounting 3.1.23	40	Accounting 3.1.26	100
Accounting 3.1.24	40	Accounting 3.1.27	100
Accounting 3.1.25	40	Accounting 3.1.28	100
Accounting 3.1.26	40	Accounting 3.1.29	100
Accounting 3.1.27	40	Accounting 3.1.30	100
Accounting 3.1.28	40	Accounting 3.1.31	100
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Accounting 3.1.34	40	Accounting 3.1.37	100
Accounting 3.1.35	40	Accounting 3.1.38	100
Accounting 3.1.36	40	Accounting 3.1.39	100
Accounting 3.1.37	40	Accounting 3.1.40	100
Accounting 3.1.38	40	Accounting 3.1.41	100
Accounting 3.1.39	40	Accounting 3.1.42	100
Accounting 3.1.40	40	Accounting 3.1.43	100
Accounting 3.1.41	40	Accounting 3.1.44	100
Accounting 3.1.42	40	Accounting 3.1.45	100
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Accounting 3.1.44	40	Accounting 3.1.47	100
Accounting 3.1.45	40	Accounting 3.1.48	100
Accounting 3.1.46	40	Accounting 3.1.49	100
Accounting 3.1.47	40	Accounting 3.1.50	100
Accounting 3.1.48	40	Accounting 3.1.51	100
Accounting 3.1.49	40	Accounting 3.1.52	100
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Accounting 3.1.51	40	Accounting 3.1.54	100
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Accounting 3.1.54	40	Accounting 3.1.57	100
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Accounting 3.1.56	40	Accounting 3.1.59	100
Accounting 3.1.57	40	Accounting 3.1.60	100
Accounting 3.1.58	40	Accounting 3.1.61	100
Accounting 3.1.59	40	Accounting 3.1.62	100
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Accounting 3.1.62	40	Accounting 3.1.65	100
Accounting 3.1.63	40	Accounting 3.1.66	100
Accounting 3.1.64	40	Accounting 3.1.67	100
Accounting 3.1.65	40	Accounting 3.1.68	100
Accounting 3.1.66	40	Accounting 3.1.69	100
Accounting 3.1.67	40	Accounting 3.1.70	100
Accounting 3.1.68	40	Accounting 3.1.71	100
Accounting 3.1.69	40	Accounting 3.1.72	100
Accounting 3.1.70	40	Accounting 3.1.73	100
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Accounting 3.1.72	40	Accounting 3.1.75	100
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Accounting 3.1.74	40	Accounting 3.1.77	100
Accounting 3.1.75	40	Accounting 3.1.78	100
Accounting 3.1.76	40	Accounting 3.1.79	100
Accounting 3.1.77	40	Accounting 3.1.80	100
Accounting 3.1.78	40	Accounting 3.1.81	100
Accounting 3.1.79	40	Accounting 3.1.82	100
Accounting 3.1.80	40	Accounting 3.1.83	100
Accounting 3.1.81	40	Accounting 3.1.84	100
Accounting 3.1.82	40	Accounting 3.1.85	100
Accounting 3.1.83	40	Accounting 3.1.86	100
Accounting 3.1.84	40	Accounting 3.1.87	100
Accounting 3.1.85	40	Accounting 3.1.88	100
Accounting 3.1.86	40	Accounting 3.1.89	100
Accounting 3.1.87	40	Accounting 3.1.90	100
Accounting 3.1.88	40	Accounting 3.1.91	100
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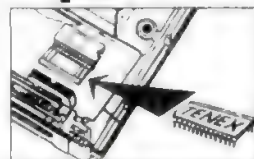
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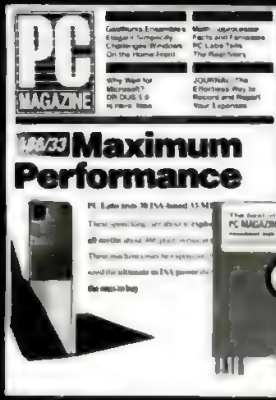
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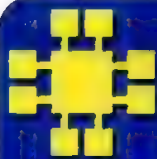
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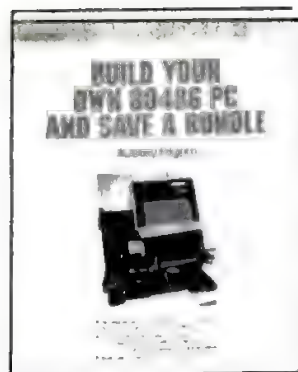
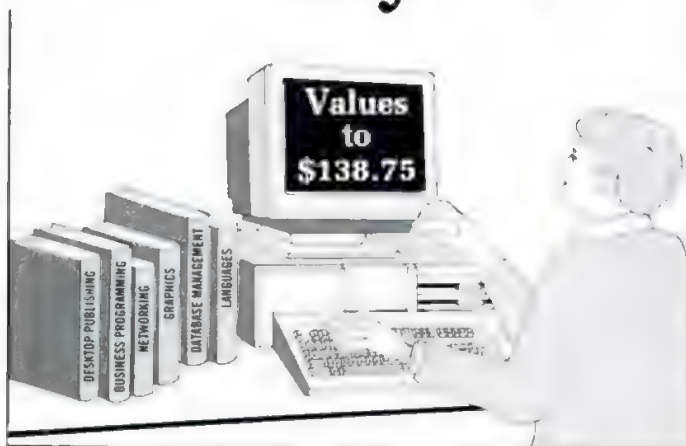
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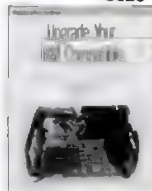
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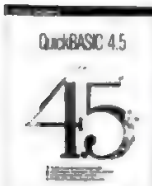
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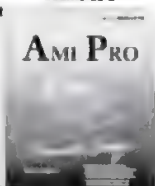
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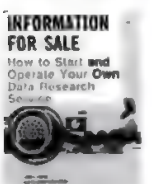
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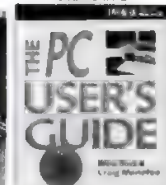
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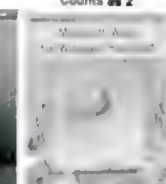
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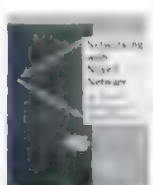
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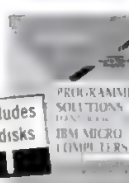
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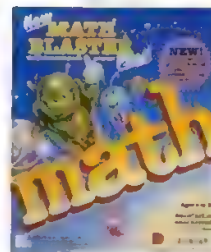
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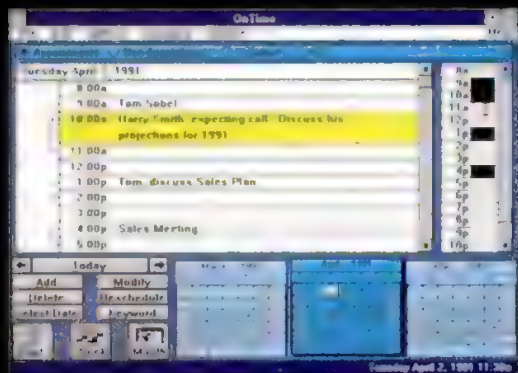
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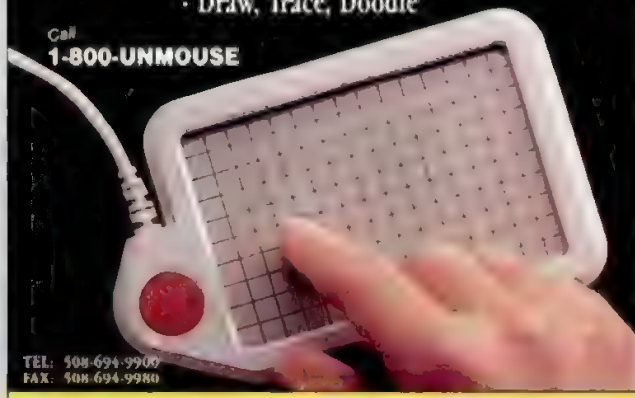
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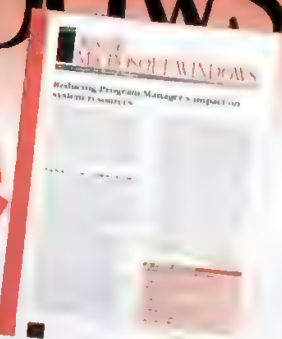
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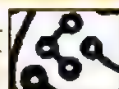
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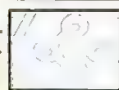
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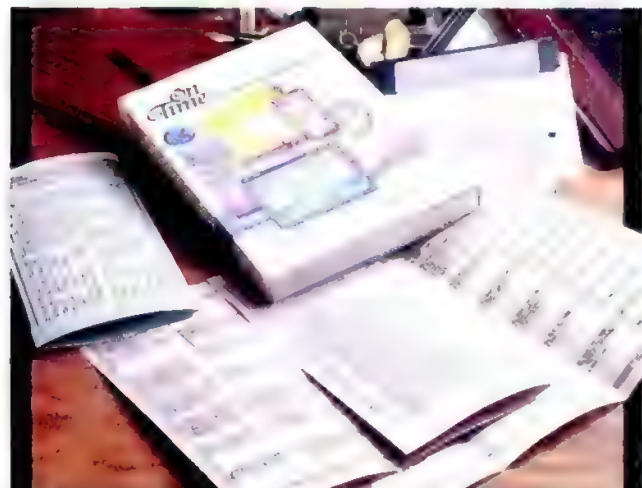


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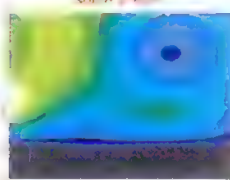
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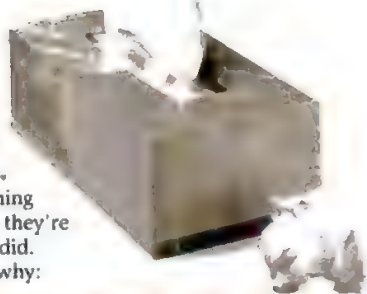
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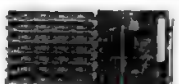
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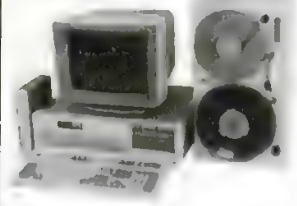
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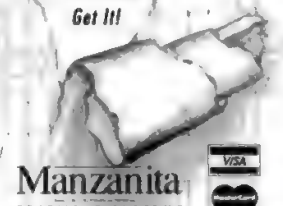
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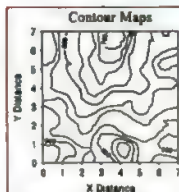
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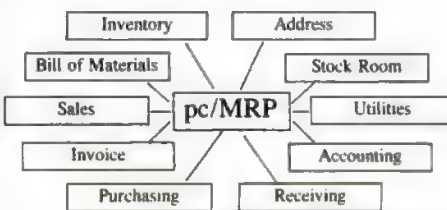
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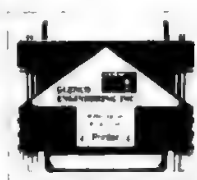
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■ \$2,000 NOTEBOOK PCs

Just what will \$2,000 buy you? There *are* notebook computers that won't send you to the poorhouse. With 386SX processors, many even have enough processing power for Windows 3.0, and almost all have enough storage capacity to hold greedy programs. In this review, PC Labs tests 15 386SX-based notebook computers and one that's 286-based. All of the notebooks include DOS and at least 40MB of storage; some even include Windows 3.0 and a mouse. And you can buy any one of them for \$2,000 or less.

■ MICRO CHANNEL MEMORY BOARDS

If you think that expansion bus memory on your IBM PS/2 or compatible may be slowly poisoning your system, you should consider trying a Micro Channel memory board to speed things up. PC Magazine Labs takes a look at new products that do the job from nine vendors—from Acculogic to Tecmar and everybody in between. We test not only for speed, but also for other important features you will need to consider in the Micro Channel memory board market: capacity, integration, SIMM type, zero-wait-state transfers, and backfill.

■ PRESENTATION GRAPHICS TIPS

Creating an attractive and coherent set of slides for presentation can be tedious and time-consuming. We've tapped the authors of books on *Harvard Graphics*, *Freelance*, and *PowerPoint* and asked them to put their best tips on paper. From the art of using templates to the secrets of effective color choices, the techniques these experts provide will help you save time when creating presentations—and should give you some ideas about how to make your presentations more effective.

■ HARD DISK UTILITIES: MORE THAN UNERASING

PC Magazine Labs takes a close look at the latest versions of three outstanding and well-known disk utility packages: *The Norton Utilities*, more talented than ever at retrieving all kinds of lost data and repairing all kinds of disk disasters; *The Norton Desktop for Windows*, which not only brings the classic *Norton Utilities* to Windows but also puts a slick Mac-like interface on top to take advantage of the graphical environment; and *PC Tools*, which has more desktop enhancements and utilities than ever before, including excellent new remote-control computing software.

■ ON-THE-FLY DATA COMPRESSION

If you're running out of free space on your hard disk, you can always buy a bigger one, but before you do, consider the advantages of on-the-fly data compression software. For less than \$250, these packages, some of which include an add-in coprocessor board, promise to double (at least) the storage capacity of your hard disk by transparently compressing and decompressing data every time you write to or read from the disk. And by accessing compressed data, they can actually improve your hard disk's performance. PC Magazine Labs conducts evaluations of *DoubleDisk*, *Expanz! Plus*, *Stacker*, and *SuperStor*.

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ENDS

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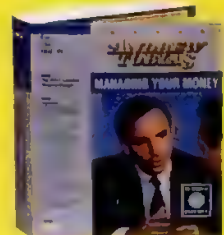
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Circle 376 ON READER SERVICE CARD

After Hours

Products for the Leisure Side of Personal Computing

Med\$ure Takes the Mystery Out of Health Insurance

FINANCE
by Barry Simon

Like everything else, medical costs have spiraled out of sight, so choosing the right insurance coverage has never been more important. In some parts of the country, a comprehensive family policy can cost more than \$5,000 per year. Many employers have responded by trying to shift more of the medical costs to you; others force you to choose from dozens of options. How do you make sure you choose the right plan?

Experts suggest that prior to your open enrollment period, you sit down with your last three years of medical bills and figure out which policy would have been the best for you. That daunting task becomes almost impossible if your spouse also has options. To the rescue comes *Med\$ure*, an innovative \$89.95 program from Time Solutions.

Not only will *Med\$ure* allow you to compare policy options, it will also track claims for you, even printing out the standard HCFA form. And it is a convenient place to track family medical records.

The downside of using the program is the need for massive data input—both your com-

pany's options and your personal medical data. Time Solutions hopes your benefits office will purchase a site license and supply the policy data to all employees. Because the program comes with oodles of lucid on-line explanation of medical insurance issues, including an extensive glossary, this would be a sensible thing for the benefits office to do.

Med\$ure is divided into six chapters. You enter the basic background data on policies and covered dependents in chapter 1, while chapter 2 is where you enter individual medical claims and track them.

For comparison shoppers, chapter 3 lets you compare out-of-pocket costs for different options using either your actual expenses for the past few years or "what if" scenarios. Chapter 4 has information on tax consequences of insurance, including an analysis of the popular but complicated Flexible Spending and Dependent Care accounts. The last two chapters provide a place to enter medical histories (including a family tree and immunization data for your kids) as well as a summary record book.

If *Med\$ure*'s book metaphor reminds you of *Managing*

Your Money, that's no coincidence: Time Solutions' president was one of the founders of MECA Software, although he subsequently left that company. But unlike *MYM*, *Med\$ure* has a clean, modern, coherent interface with mouse support and lots of intelligence. For example, as soon as you enter a last name in the people section, *Med\$ure* fills in the other data fields if it finds someone else with the same last name. Just about the only disappointment was the poor quality of the character-based graphics illustrating height/weight growth for your kids.

Getting much out of *Med\$ure* will require a considerable investment in time for data entry, but with thousands of dollars at stake, can you afford not to make that investment?

List Price: *Med\$ure*, \$89.95. Time Solutions, 45 Kellers Farm Rd., Easton, CT 06612; 800-552-3302, 203-459-0303.

■ **FINANCE**
WinCheck and *CheckFree* bring your checkbook to the PC

■ **ENTERTAINMENT**
Battle the Luftwaffe's Secret Weapons in Lucasfilm's latest simulation

■ **NUTRITION**
Count your calories electronically with *Health and Diet* and *Nutri-Cal*

Requires: 512K RAM, DOS 2.1 or later. Hard disk, mouse recommended.

CIRCLE 617 ON READER SERVICE CARD

WinCheck Offers Slick Graphical Interface

FINANCE
by Barry Simon

Wilson WindowWare's \$69.99 *WinCheck* provides basic checkbook management and printing with a wonderful interface. The program makes elegant use of the Windows 3.0 interface to best the checking components of standard personal finance packages such as *Quicken* and *Managing Your Money*.

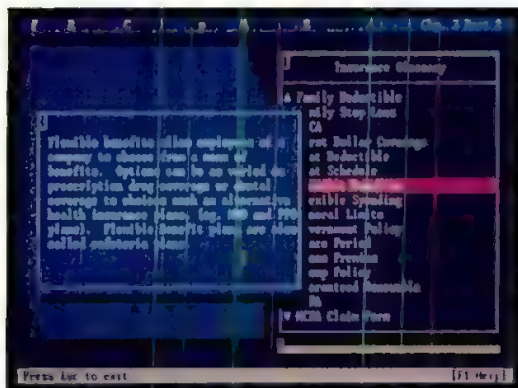
All the devices Windows lovers crave are here. There is an icon bar, so to enter a debit card charge, for example, you click on the icon of the credit card to open a dialog box. Entering an ATM charge can be done using radio buttons that let you choose among the most common amounts without having to type in any numbers.

You set up check printing on almost any kind of check you'd like with a check-drawing module that lets you drag the various pieces like date and amount into the right locations. *WinCheck* can even handle a switch to landscape mode.

Many of the dialogs are modeless, which means you can leave them on-screen, easily switching between entering several kinds of transactions.

While the *WinCheck* interface is a pleasure to use, if you want to go beyond the basics the program's limitations are likely to stymie you. You can set up a budget, but it has to have the same amount for each month, so you can't smoothly plan for something like semiannual car insurance payments. There is a

CONTINUES



One of *Med\$ure*'s bonuses is its glossary of medical insurance terms.

After Hours

WinCheck

CONTINUED

lovely report module that you customize with a mouse, but it is currently limited to reporting on one account at a time.

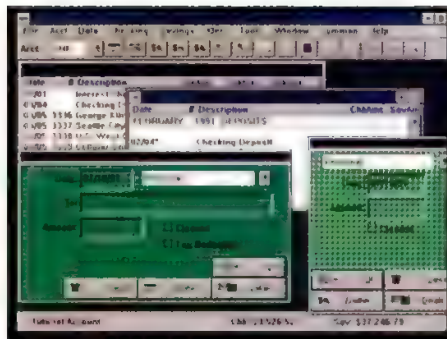
Windows users with simple requirements in a check-writing program will want to grab this

one right away. Those who need more than the basics will probably want to wait for a later version of what is an extremely promising program.

List Price: *WinCheck*, Version 3.0H, \$69.99. Wilson WindowWare, 2701 California Ave. SW, #212, Seattle, WA 98116; 800-762-8383.

Requires: Microsoft Windows 3.0. Mouse recommended.

CIRCLE 618 ON READER SERVICE CARD



WinCheck takes full advantage of the Windows 3.0 environment. It lets you open up multiple reports and dialogs.

CheckFree 3.0 Improves An Already Solid Product

FINANCE
by Steve Nelson

If you've ever thought that there must be a slicker way to pay your bills—one that doesn't require envelopes, stamps, and check forms—you're in luck. *CheckFree*, Version 3.0, pays bills electronically and keeps detailed banking records.

CheckFree 3.0 adds a bundle of handy new features to an already solid product: better electronic mail; an almost graphical interface that uses things like pull-down menus, dialog boxes, and command buttons; better payment scheduling; redesigned reports and new reports; the ability to export data files to *Excel* and *TaxCut*; a pop-up calculator; and a calendar.

Here's how *CheckFree* works. You authorize Checkfree Corp. to write checks on and electronically withdraw money from your account. Then you periodically send payment instructions to the service via modem, telling it when, how much, and whom to pay. The people at Checkfree execute your instructions, either electronically transferring money to the merchant or just writing a check.

In terms of security, the *CheckFree* system offers as much safety as a cash machine card. Just like a cash card, it uses a personal identification number (PIN), which must be included as part of any payment instructions. Optionally, the PIN can also be used as a password to gain access to the *CheckFree* software.

If this doesn't sound all that handy, consider a couple of examples. First, suppose you make a monthly mortgage payment. You can instruct the Checkfree people to pay your mortgage on, say, the tenth of every month. After that point, the Checkfree people will pay your mortgage like clockwork until you tell them to stop. You can also have *CheckFree* remind you when credit card and utilities bills are due. This automatic scheduling should reduce bill-paying hassles and may even eliminate late payment charges.

One potential drawback to *CheckFree* is that the service doesn't send in the merchant's payment coupon when it pays each bill. Even though *CheckFree* clearly describes each payment it makes, and any confusion is the fault of the mer-

chant's accounts payable system, you may be in trouble.

CheckFree does more than just pay bills. It also tracks bank account balances by recording transactions, tallying income and expenses to reconcile your account. But compared with popular checkbook programs like *Quicken*, *CheckFree*'s record-keeping functionality is light. It doesn't print checks, nor does it give you as many ways to categorize and classify transactions or custom reports.

If you want to use *CheckFree*, however, its limited record-keeping functionality doesn't have to be an obstacle, since in addition to selling as a standalone prod-

uct, it is incorporated into several personal financial management programs, including both MECA Software's *Managing Your Money* and Intuit's *Quicken*. Besides, who else will pay your bills for you?

List Price: *CheckFree*, Version 3.0, \$29.95, plus \$9.95 per month, starting in the second month. (After 20 payments, \$3.50 for each additional 10 payments.) Checkfree Corp., 720 Greencrest Dr., Westerville, OH 43081; 800-882-5280.

Requires: 512K RAM, hard disk or two floppy disk drives, DOS 2.1 or later, modem.

CIRCLE 619 ON READER SERVICE CARD

Lucasfilm Combines Historic Accuracy with Seat-of-Your-Pants Action

ENTERTAINMENT
by Bill O'Brien

What do you do once you've beaten back the Japanese in the Pacific and kept the Germans from invading Britain? If you're Lucasfilm Games, you spend the next year and a half designing a combat simulator that expands the theater of war to Europe. That's the setting for the new \$69.95 *Secret Weapons of the Luftwaffe*.

Before anyone has a chance to get bent out of shape, this is not an aggrandizement of the Third Reich. *SWOTL* pits the United States Eighth Air Force against the advanced weaponry of the German Luftwaffe in a historically accurate World War II air combat simulation.

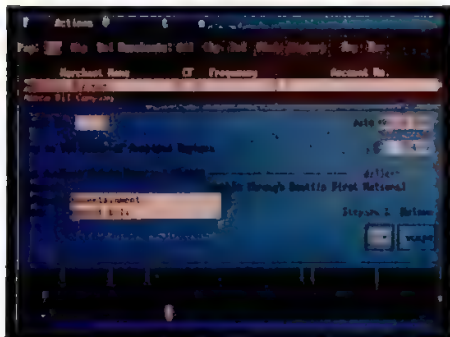
The first rule of playing *SWOTL* is to pump up your computer. Don't try it with any-

thing less than 16 MHz (and anything under 25 MHz will seem a little slow). Then pump up your display system. *SWOTL* will work with any color display at or below VGA level. At its best, it uses 256 colors in VGA 640-by-480 resolution. You'll be happy with anything you try until you see the 256-color level. It is incredible. In *SWOTL*, when a target explodes, it blows apart complete with smoke, fire, and sound.

All this detail doesn't detract from the speed of the game. When you have two aircraft approaching each other at closure speeds in excess of 800 mph, you can't afford to have delays. *SWOTL* won't let you down.

On the Allied side, you create and train pilots through missions, and you enlist your pilot in a tour of duty that spans 25

CONTINUES



To describe a payment you want *CheckFree* to make, you fill out a data entry window that looks like a check form.

After Hours

Secret Weapons

CONTINUED

missions for the Americans, 50 for the Germans. Each tour can be set for moderate, difficult, and "impossible?" levels of combat, and with eight tours for the Allies and five for the Axis, the numeric possibilities are staggering. On the average, a mission can last for 20 minutes.

As an American pilot, you'll find the P-47 Thunderbolt, the P-51 Mustang, and the venerable B-17 Flying Fortress. Germany starts off with the Bf-109 and FW190 fighters—the propeller-driven mainstays of the

Luftwaffe. But *SWOTL* also gives you jets: Germany's ME-163B Komet and the ME-262. There's even a Go-229 fighter-bomber (capable of a speed of 610 mph with a nearly 2,000-mile range) that luckily never saw action during the war. And Lucasfilm promises a series of additional airplane disks, starting with the P-38 Lightning.

Make no mistake, war is hell. But *Secret Weapons of the Luftwaffe* is one hell of a war game. **List Price: *Secret Weapons of the Luftwaffe*, \$69.95.**

Lucasfilm Games, P.O. Box 10307, San Rafael, CA 94912; 800-782-7927. **Requires:** 640K RAM (768K for Tandy), hard disk, DOS 3.0 or later.

CIRCLE 820 ON READER SERVICE CARD



The detail in *Secret Weapons* is phenomenal. This cockpit shot is in standard VGA, but at its highest resolution, you can read the labels on the VDO gauges in the German aircraft.

Two Nutrition Packages Count Calories Digitally

NUTRITION
by Kellyn Bette

If you're compelled to track every detail of your diet down to each teaspoon of mayonnaise, you should probably consider nutrition software. Packages like Software Solutions' \$24.95 *Health and Diet* and Camde Corp.'s \$57 *Nutri-Calc* are guaranteed to raise the calorie counter's level of food awareness.

Like sticking to a diet or exercise regime, using consumer-oriented diet software requires discipline and regular participation. In order to learn just how well their diet stacks up, users should be willing to commit at least 15 minutes a day to recording the minutia of their diets—how many tablespoons of olive oil were in that lunchtime serving of pasta, how many slices of cucumber were in the salad.

Nutri-Calc even encourages people to count the number of glasses of water they consume.

Both of the software packages are built around huge databases of food information, much of which was compiled by the U.S. Department of Agriculture. The USDA's listings tend to be generic, so both packages have supplemented them with brand-specific and company-specific foods, such as Campbell's Tomato Soup. It's important to note that this software builds its nutritional assessments around the newer and more complete National Academy of Sciences RDA listings, not the 1968-data-based USRDA listings you find on food packages. Both *Health and Diet* and *Nutri-Calc* group the foods together in logical categories and allow the addition of recipes.

The beauty of computerizing these food databases is in the

ease of calculation. All you do is pick a food and enter a percentage approximating the amount you consumed relative to the database's standard serving size. The packages take care of all the caloric multiplication for you.

Health and Diet is the simpler of the two packages, and is more appropriate for a dieter than a health fanatic. The 2,000-odd-item database in Version 2.0 provides data for ten basic components: calories, carbohydrates, cholesterol, proteins, sodium, fiber, and four fat measures. This is probably sufficient for most calorie counters' needs, and it gives the program the means to provide users with a simple but effective diet scorecard: computations detailing the percentage of calories derived from protein, fat, and carbohydrates.

One of the most important dietary recommendations from the Surgeon General is the suggestion that less than 30 percent of the calories we consume should come from fat. *Health and Diet's* graphical representations of how much fat a seemingly healthful meal can have (if it has cheese or oil hidden somewhere inside it) can shock you. To display dietary trends, *Health and Diet's* graphs can compute the percentages of calories from fat racked up in a meal, a day, a month, or a year.

For users with a greater need for enumeration, *Health and Diet* provides the means to track two

additional items of nutritional data. I selected calcium and iron, but in order to track these, I had to find and enter the nutritional data myself, altering each record in the program's food list.

Software Solutions justifies this data entry requirement with the argument that most people consume only a small percentage of the 2,000 foods on the list. Still, providing the data for even 50 foods is more trouble than it's worth.

If you want a more detailed dietary diary, you're better off with *Nutri-Calc*. *Nutri-Calc* tracks 30 components to *Health and Diet's* 10, so calcium and iron are two of the more recognizable items already included. In fact, the nutrient list is so complete that some of the more esoteric vitamins and minerals just aren't known for many items on the master food list. This thoroughness betrays the package's nutritionist roots: It is actually a scaled-down version of one offered to dietitians.

Nutri-Calc's database contains 1,600 foods, and an additional 1,800 are available for \$50. Food data is as easy to enter as with *Health and Diet*, but analyzing it can be daunting. Many of the nutritional analyses (for example, the calcium-to-phosphorus ratio), are beyond the scope of even an educated layperson. But these detailed analyses can be quite important; for instance, the calcium-to-phos-

CONTINUES

Health and Diet shows you the current meal's nutritional and caloric content, as well as that of your daily goal.

After Hours

Nutrition

CONTINUED

phorus ratio would be important to osteoporosis-prone older women. *Nutri-Calc's* inability to save or historically graph more than a day's worth of dietary information is its most serious limitation.

When it comes to calculating how many calories users should consume, neither *Health and Diet* nor *Nutri-Calc* can completely shake the specter of voodoo calorie economics. The National Academy of Science presently recommends that calorie requirements be determined by assuming a typical weight and height for each sex's age classes: Men ranging in age from 25 to 50 are assumed to be 5 feet 10 inches in height and weigh 179 pounds, so every man is estimated to require a

total of 2,900 calories per day!

Health and Diet and *Nutri-Calc* both offer this standard calorie-counting method, but each has devised alternatives to it. *Health and Diet* lets users enter information about their average daily activity levels by choosing exercise-type activities from a list of exercises and hobbies. *Nutri-Calc's* approach is more complicated. It lets users create an "average activity profile" for a "typical" 24-hour period. You get to detail how much time you spend sitting quietly, cooking, cleaning, and walking at a variety of speeds; entering this data is quite time-consuming.

After you decide how many calories you need to consume, *Health and Diet* creates a personal weight loss/gain goal for you. *Nutri-Calc* doesn't offer weight change as a goal, though it allows users to determine their nutritional needs based on ratios such as calcium:phosphorus.

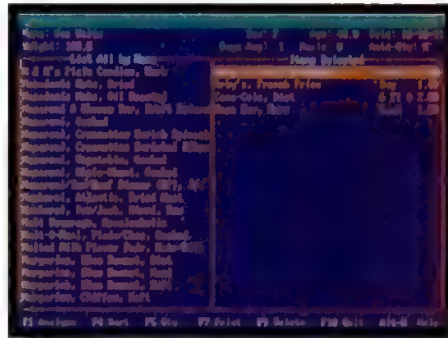
For the weight-conscious, *Health and Diet* provides a focus on food without demanding an overwhelming amount of detail. *Nutri-Calc's* global vitamin and mineral tracking abilities make it more appropriate for nutritional zealots and people with special medical needs. Though the rest of us could improve the quality of our diets by using these software packages, we probably aren't sufficiently motivated to put the necessary time into using them. ■

List Price: *Health and Diet*, \$24.95. Software Solutions, 10220 Scripps Ranch Blvd., Building M, Suite A, San Diego, CA 92131; 619-695-3598. **Requires:** 475K RAM, 1.5MB hard disk space, DOS 2.1 or later.

CIRCLE 621 ON READER SERVICE CARD

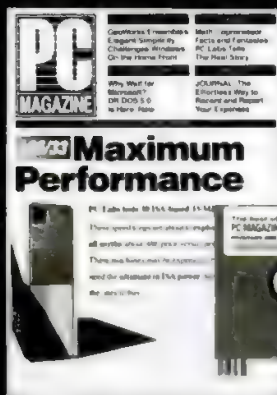
List Price: *Nutri-Calc*, \$57. Camde Corp., P.O. Box 2006, Chandler, AZ 85244; 602-821-2310. **Requires:** 512K RAM, DOS 2.0 or later.

CIRCLE 622 ON READER SERVICE CARD



The heart of *Nutri-Calc* is its master food list, which is shown on the left side of this screen.

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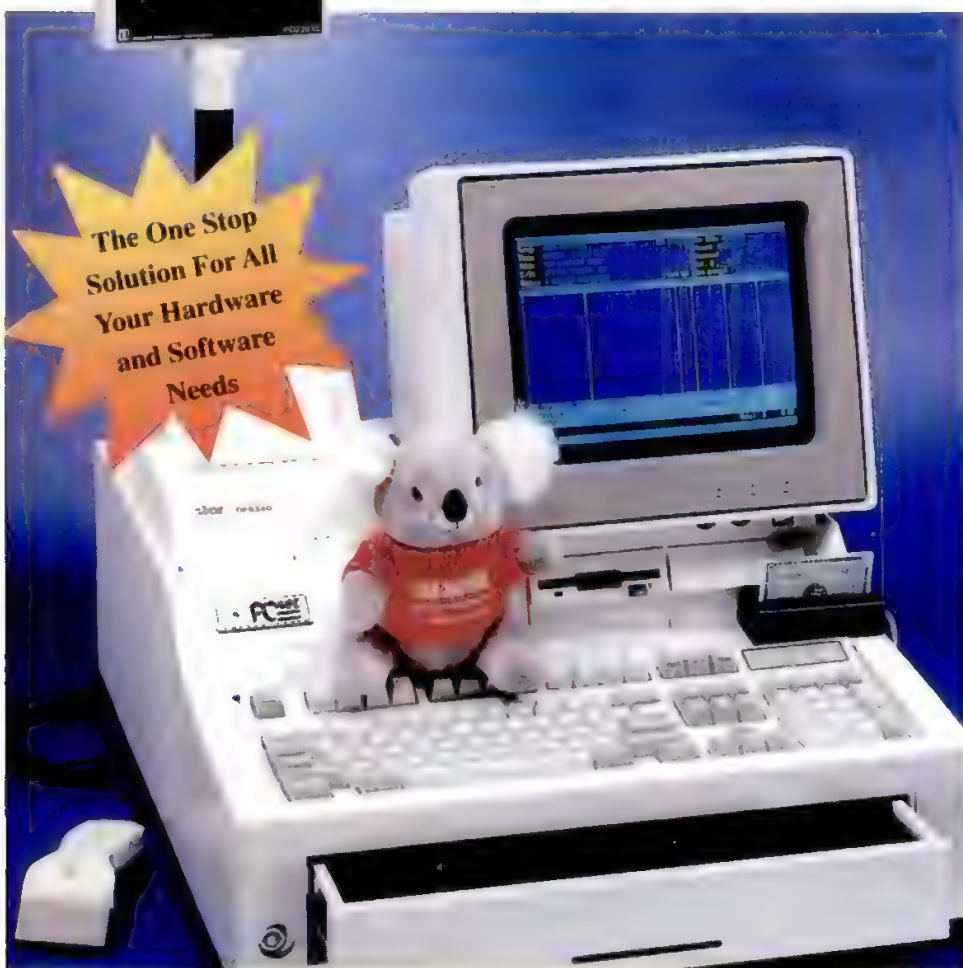
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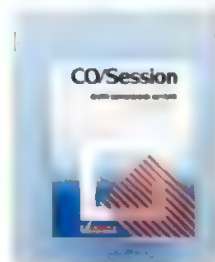
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by
Bill Howard

Abort, Retry, Fail?

The Lighter Side of Personal Computing

Clarification

Alps America Inc. incorrectly identified the monthly duty cycle of its recently introduced 16-page-per-minute LSX1600 laser printer. The printer is actually rated for a duty cycle of 50,000 hours per month.

Every editor has days like this: Whatever was wrong with the original story, *InfoWorld's* September 23, 1991, clarification didn't clarify matters much.

Amazing Facts

"Most, though not all, 300-dpi laser printers accept both parallel and serial cables for passing information back and forth with your computer. Because serial cables contain more usable pins, they can pass more complex instructions. Unless you choose a low-end device, your printer should operate from a serial port."

—*Government Computer News*,
April 15, 1991

"If you like Windows 3.0, Microsoft's easy-to-use graphical software system, you should buy a machine powerful enough to run it... Windows will not work on a computer with the popular but slower 286 microprocessor."

—(San Fernando, Calif.)
Daily News, May 20, 1991

If your entry is used in *Abort, Retry, Fail?* we'll send you \$50 and a *PC Magazine* T-shirt. Caution: In case of multiple entries, the postmark date, neatness, and completeness of entry are considered. Winners this issue: C.M. Wilkinson (50,000 hours per month), B. Humphrey, Jr. (low-end device), Cy Tymony (Windows on a 286), Richard H. Price (near-laser quality).

Adobe Type Manager 1.1 \$58

Get crisp, clean-looking text automatically, at any point size and in virtually any Windows 3.0 program with Type Manager including ATM software. You also get near-laser-quality output with the HP LaserJet, DeskJet, dot matrix or other non-PostScript printer.

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Type Align for Windows is a powerful tool for adjusting text. Stretch, skew, and rotate text.

According to this PC Zone ad, Adobe Type Manager plus a LaserJet gives you "near-laser quality output. . . ."

As fate would have it, the release of Wayne's Wallet computer would be postponed for several weeks

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| ☐ 286-based systems | ☐ i486-based systems |
| ☐ i386™SX-based systems | ☐ UNIX® based systems |
| ☐ i386-based systems | ☐ Notebooks |
| ☐ i486™SX-based systems | ☐ Other: _____ |

2. Are you interested in computer products for:

- ☐ Home ☐ Business ☐ Resale

3. If for resale, please identify your primary customers:

- ☐ General Business ☐ Government ☐ Education ☐ Medical

4. How many PCs does your company plan to purchase in the next
twelve months?

Quantity	Timeframe	Quantity	Timeframe
_____	Less than 1 month	_____	6-12 months
_____	1-3 months	_____	More than 12 months
_____	3-6 months		

5. What do you plan to use computer products for?

6. How many PCs do you have installed now at your company?

7. Are you interested in leasing? ☐ Yes ☐ No AD CODE 518Q1

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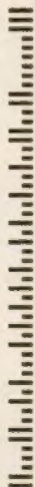


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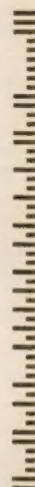


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Zenith MastersPort 386SL—4 MB RAM and 60 MB Hard Drive	\$4,798
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